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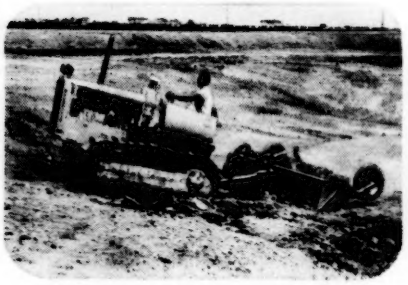

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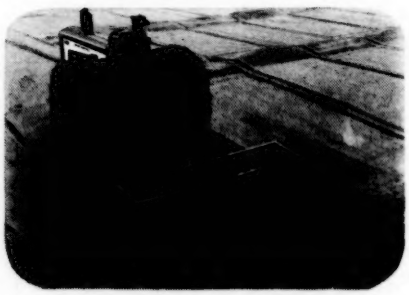

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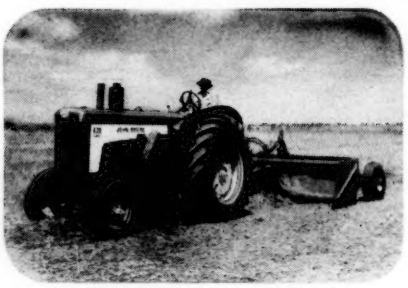

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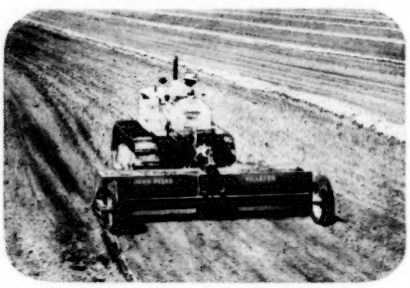

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VOLUME 14
NUMBER 4

TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

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COVER: The American Bison has largely passed from the Great Plains of North America. It is now commemorated on the U.S.A. nickel. The West was "won," so it is said. A truly great era would come to the West, provided man will apply the best practices of "environmental" conservation.

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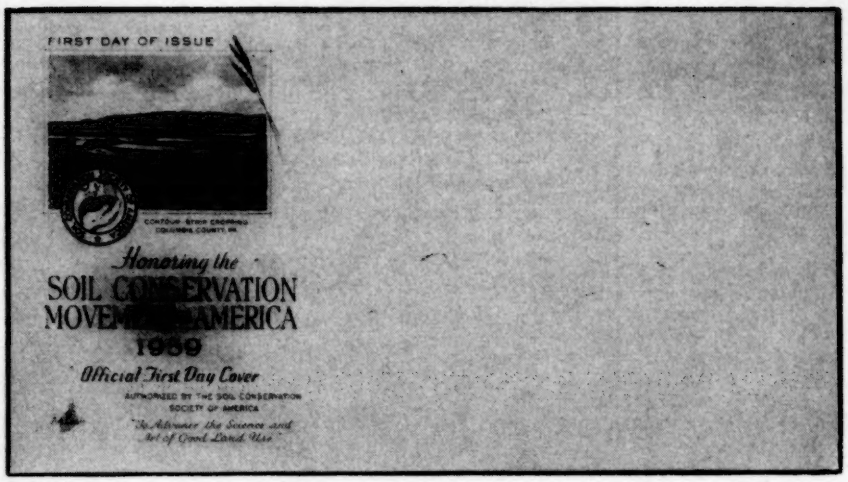
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Control of Wind Erosion in the Great Plains

D. G. CRAIG

THE TEN Great Plains States contain most of the semi-arid lands of the nation. Within this area is the Great Plains agricultural region which extends from the Eastern Slope of the Rockies to the 98th meridian to the east. The region is about 750 miles wide at its widest point across Montana and North Dakota, and extends from the Canadian border on the north to the Mexican border on the south. It contains 586,461 square miles or 20 per cent of the land area of the nation. One-third of the people living in the 10 states or 3.7 per cent of the population of the entire United States live in the area. The Great Plains encompasses the "Dust Bowl" which attracted national and international attention in the 1930's and again in the 1950's.

The climate of the Great Plains varies widely. Hot summers and cold winters are characteristic. The region is clearly distinguished from the humid area to the east and the arid area to the west.

Back in the days of the homestead, and before, the Plains appeared to give promise of untold riches and consequently beckoned strongly to settlers from elsewhere. People were enticed by the great expanses of grasslands. They could run cattle on these treeless expanses or break out the land and cultivate it without having to clear it of brush and briars.

Rumors that this was a "Great American Desert" did not dim hopes. The settlers brought with them, however, their humid-area ways of living and farming and grazing which had not as yet been tested in the land of recurring drouth and wind.

In a short time many of the settlers discovered that the pot of gold at the end of the rainbow was most elusive. The grass, once grazed off, did not spring back in a few weeks like the grass in the higher rainfall areas to the East and Southeast. Crops did not grow at the mere scattering of seeds. There was only the guarantee that crops and grass would grow if it rained. As time went on many of the settlers suffered great privations, and departed from certain parts of the Plains. They did not really understand this new country and did not know how its lands must be managed.

As exploitation of the land resources continued, more and more land lost the protective cover needed for stabilization against the forces of wind and water. Then came the searing drouths of the 1930's. The stage was set for disastrous wind damage. And a "Dust Bowl" became famous (Figure 1).

Cover on the Land

In the Plains, when it is dry, vegetative cover disappears from cultivated and native range land. If the wind blows there will be dust. And usually the wind does blow. Drouths and wind are natural and are expected.

Figure 1. This was a dusty day in New Mexico. It can happen almost any place in the Great Plains when the land is unprotected. The results of a bad blowing soil condition are apparent.

The balance between a fertile, productive and stable soil condition and a condition where the soil is unstable and will join with the wind in flight is quite critical in semi-arid country such as this (Figure 2).

Figure 2. Arable lands in the Great Plains—when protected against wind and water damage—are capable of producing bumper crops such as this wheat in Oklahoma.

D. G. Craig is Southern Great Plains agronomist with the Soil Conservation Service, Fort Worth, Texas. His paper, written on request of the Journal, should serve to aid travelers crossing the Great Plains in interpreting much that they see — particularly land and water conservation practices which increasingly are becoming an important part of the Western scene.

Research and experience show that a certain amount of plant cover must remain on the surface of the soil if growing plants are to remain vigorous and productive. Cover is necessary if the soil is to be kept in a state of stability which will fend off disastrous forces of wind and water.

On Great Plains grassland this means leaving enough of forage plants to protect the soil and keep the plants in a healthy and vigorous condition. Annually, at least 50 per cent of the current growth should be left. The root systems of range forage plants will become weakened if they are subjected to continuous over-use. Without a healthy root system a strong plant cannot be grown. Weak plants provide too little soil protection and in effect invite soil blowing (Figure 3).

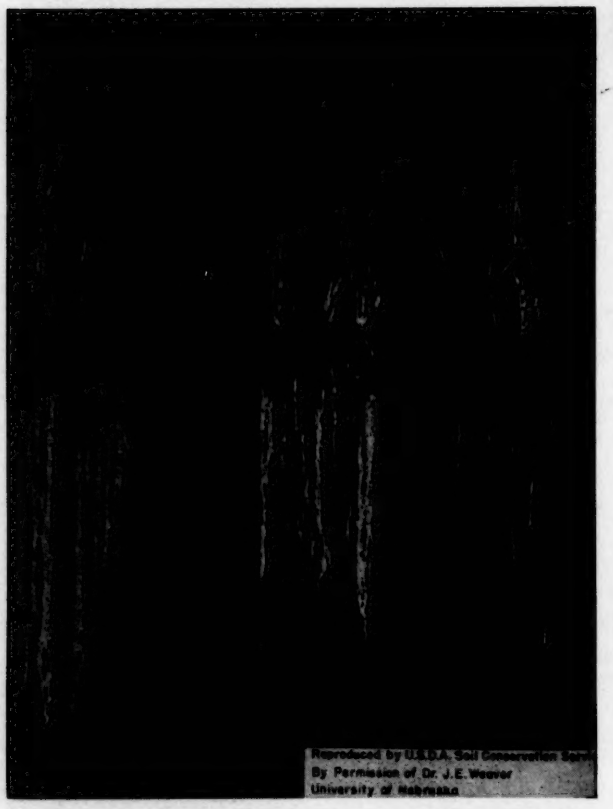

Figure 3. Bluestem grass plants show what happens to the top and root systems under various degrees of use. Left, *No Use;* center, *Moderate Use;* and right, *Over-use.* Plants moderately used (center) help in maintaining a good soil cover and providing the most grazing use over the years.

On cultivated land, enough crop residues must be preserved on the surface of the soil to tie it down when it is not protected by a growing crop.

In the early days little attention was paid to what kind of land was broken out of native grass for cultivated crops. Much land was placed under cultivation that was not suitable for that purpose. There was in 1950 more than 12 million acres of this kind of land, cultivated or idle. All without a good cover.

One of the primary steps in wind-erosion control is to get such land back to grass so that it can be used as range. Accomplishments along this line are on the increase. Thousands of acres of this kind of land were reseeded in 1958 alone (Figure 4).

Figure 4. Land seeded back to grass is an important practice in the Plains to provide protective cover. Some seeding operations are on a big scale such as this one in Oklahoma.

Essential in a revegetation program is a willingness and a desire on the part of the landowner or operator. The techniques are simple:

- In most locations, the land must first be planted to a crop such as sorghum which provides a residue cover needed to stabilize the soil and protect the young, tender grass seedlings.
- The grass must be planted, preferably drilled into this cover.
- Then comes a waiting period of two or more years before the grass should be grazed.

Proper use is necessary on all grassland. This means leaving enough of the growth—50 per cent of the current year's growth—on the land to protect and hold the soil and assure the grass plants remaining are vigorous and productive. Healthy plants are able to take advantage of small amounts of rainfall and make good use of the fertility of the soil. Well-distributed livestock water sources help to bring about more uniform grazing of the range (Figure 5).

Figure 5. Good grass and fat cattle go together such as here in Texas.

On cultivated lands, the principles of management are somewhat similar to those on the range. The land must be provided with a continuous cover for soil protection and high production. Carrying out a good management program on the non-irrigated cultivated lands, to keep them productive and stabilized, requires considerable ingenuity on the part of the farmer.

Several conservation practices go hand in hand in various combinations and degrees of intensity, depending on the soil, slope and climate.

Stubble Mulching

One of the important practices for wind and water erosion control on the non-irrigated crop lands in the Plains is stubble mulching. Four things are necessary:

- There must be some crop residues with which to work.
- The residues must not be removed from the fields by burning or excessive grazing.
- Tillage machinery must work under the residues or in such a way to keep as much of them on the surface of the soil as possible.
- The new crop must be planted through the mulch into the mineral soil.

Stubble-mulch cultivation is adapted to row crops or small grains and combinations of the two. An objective is to have enough residue cover on the soil surface for soil protection at the time of planting the next crop. Research shows that on sandy soils about 1,500 pounds of small grain stubble is required on the surface at the time the next crop is planted. Moderately coarse and fine-textured soils, such as fine sandy loam and clay, require around 1,250 pounds and the clay loams and other medium textured soils need about 750 pounds. The amount of residues on the surface can be measured or after some experience fairly estimated. Experience and research have provided guides on how much residue will be covered on the average by various types of equipment each time over the field. For example, the one-way disk will cover about half of the residue on the field. A machine equipped with 32-inch or wider sweeps or with blades will cover only about ten per cent. Thus, by knowing the requirements of surface stubble for soil protection on a given field, a farmer is able to determine how many and what kinds of seedbed preparation operations he should use and still keep enough cover on the surface (Figure 6).

Residue management practices, incidentally, benefit pheasants which like to nest in stubble-mulched fields.

Drouths are normal for the Great Plains. There have been and will continue to be times when cultivated crops will not, because of a lack of moisture, produce enough growth to furnish the amount of cover needed for soil protection. In such years, all cover must be preserved for as long as possible.

Even with residue management, a new crop, particularly in the winter wheat country, will not always become sufficiently well-established to hold the soil. Added measures are needed to put the soil in a condition to resist blowing. The practice of "soil-surface roughening" or "emergency tillage" is useful during drouths. Emergency tillage is a temporary practice at best, but when needed it becomes important. Guide lines for this practice have been established through research and experience.

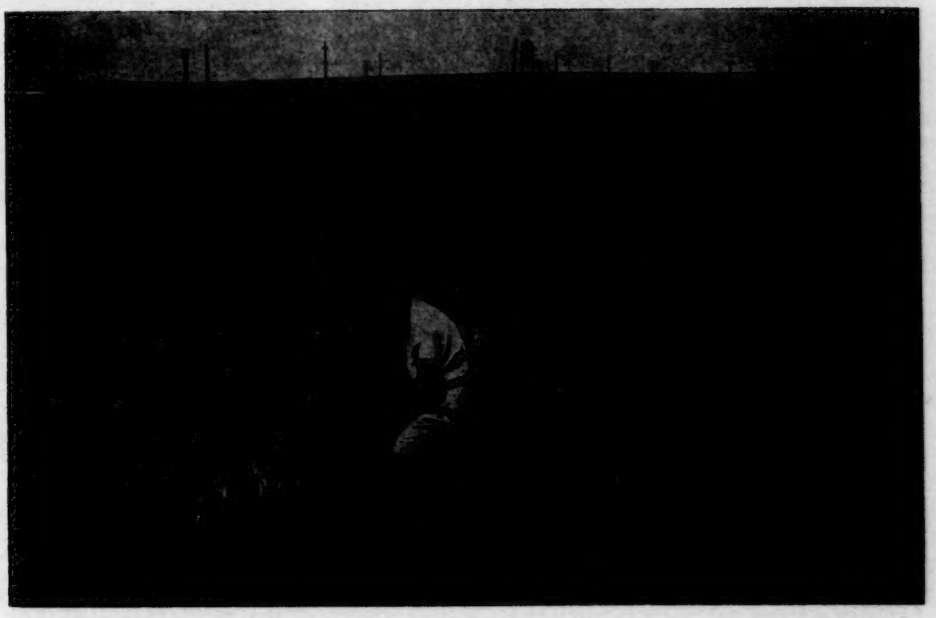

Figure 6. A good job of stubble mulching in Oklahoma as it appears just before seeding a new wheat crop. The land is well protected with crop residues.

Windbreaks

Trees are outdoor "air conditioners." Trees in windbreaks help protect soil, plants, beasts and human beings against hot searing summer or cold freezing winter winds.

Windbreaks are of two primary types—field windbreaks and farmstead windbreaks. Windbreaks, where they can be successfully grown, are another conservation practice or tool used by farmers and ranchers on the Great Plains (Figures 7, 8 and 9).

Field windbreaks primarily protect crops, soil and grazing livestock. They often run along field boundaries and sometimes cross a field at regular intervals. Field windbreaks help to control soil blowing and cut down the drying effects of wind on soil and plants. In the northern part of the Great Plains the windbreaks trap winter snows. This captive moisture supply is used later by growing crops, grasses and the windbreak plants. Spacing has been worked out through research and field experience.

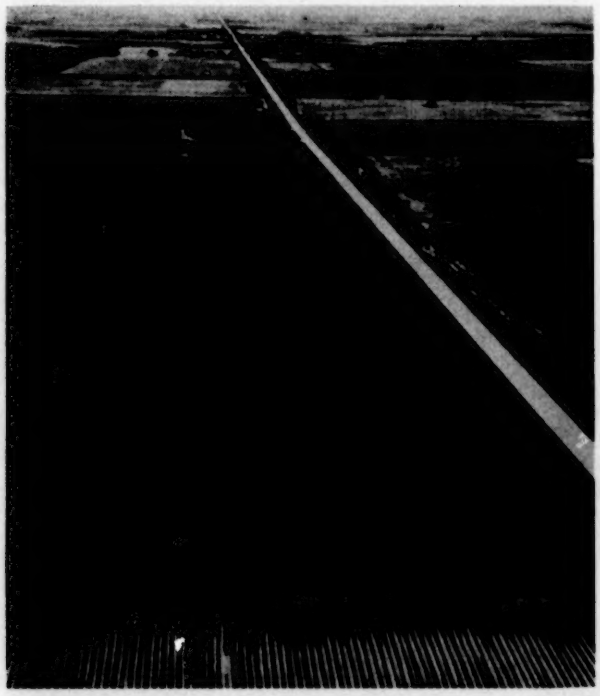

Figure 7. A combination farmstead and field windbreak such as this one in Nebraska gives protection to both the buildings and the cultivated land.

Farmstead windbreaks are primarily for the protection of buildings, feed lots and corrals.

Trees and shrubs in windbreaks furnish homes for birds. If food and water are available, the windbreak makes an excellent wildlife habitat for such game birds as pheasant and quail. Fruit-producing plants furnish food for processing and use by land-owners and others.

Well-designed windbreaks deflect most of the wind over the trees with some filtering through the branches. Such a windbreak will cut the speed of a 30-mile-per-hour wind to less than half this much near the windbreak and will slow it down as far out as 15 to 20 times the height of the trees. Most soils will not blow until wind currents move faster than 15- to 20-m.p.h. at ground level.

The benefits of windbreaks on crop yields have not yet been thoroughly tested by Experiment Stations. In South Dakota, however, 331 farmers were interviewed regarding their observations of the effects of windbreaks for the years 1952, 1953 and 1954. Six out of seven (274 farmers) noted increased crop yields in one or more of the three years. Their estimates showed increase of 5 to 9 bushels of corn per acre on fields protected by windbreaks. The Canadian Experiment Station found an average of 0.7 bushels per acre increase in wheat yields on fields protected by windbreaks. The greatest increases came during the driest years.

Although accurate crop-yield information is meager, the fact remains that windbreaks play an important part in various parts of the Plains region in the control of wind erosion. As long as there are benefits such as those described, farmers will continue to want and to use windbreaks. And, people just naturally like trees.

Figure 8 (*above*). A farmstead windbreak around the homesite such as this one in North Dakota is a common sight in the Plains. Other field windbreaks are evident.

Figure 9 (*below*). Pheasants like to strut around and nest in windbreaks such as here in North Dakota.

Figure 10. This peanut field in Texas is being protected by strips of Sudangrass and a winter cover crop of rye.

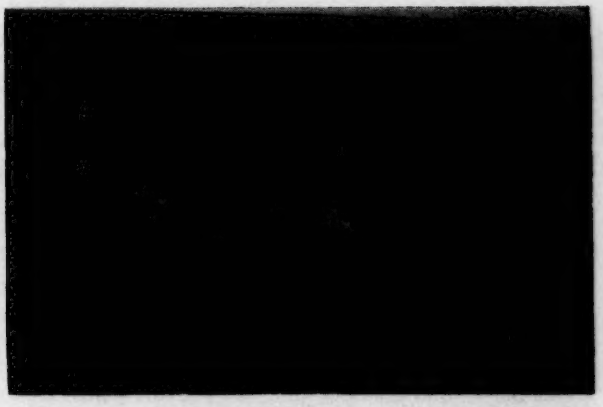

Figure 11. Strip cropping similar to this in Nebraska is a common practice in the northern Great Plains states.

Grass Strips and Grassed Waterways

In some of the sandier areas of the southern Great Plains, two or more rows of a thickly-planted annual such as sudan grass, or of a tall, thick, upright-growing perennial grass are planted leaving from 10 to 20 rows for other crops (Figure 10).

Crops such as peanuts, which produce very little stable residue and provide very poor soil protection after harvest, are grown between these grass-strip wind barriers. Similar wind barriers are used in some of the irrigated truck-crop areas to protect tender tomatoes or lettuce against blowing sand and hot winds. This windbreak practice is also used by farmers on some of the sandy soils where cotton is grown. Yields of vegetables and cotton have been increased by the use of such wind barriers. The necessity for replanting a crop due to "blowing out" has been almost eliminated.

Grassed waterways are important throughout the Plains. They provide a way to move excess water from a field to a place of safe disposal. Waterways also furnish some hay and grazing and provide wildlife with shelter and food. Both introduced and native species of grasses are used. In the drier areas native species have proved to be the best.

Strip Cropping and Other Practices

Strip cropping is a valuable wind-erosion control practice in most of the northern Great Plains states. When used with other controls such as stubble mulching, strip cropping helps to make more complete the treatment needed on many kinds of land. Here again research and experience have furnished information on desirable width of strips needed to provide protection against wind and water erosion. Widths range from a little over one rod for very sandy soils to over 20 rods for clay loam or silty clay loam. Field strip cropping is much in evidence as one travels through the northern states of the Great Plains. In the southern Great Plains, where winters are milder, the advantages of strip cropping seem fewer and the practice is much less noticeable (Figure 11).

There are other conservation practices used to control wind erosion. Terracing, contour cultivation and cover crops are significant practices on the drylands of the Plains. On irrigated lands proper use of irrigation water, land leveling, irrigation systems and residue management are important conservation and production techniques. Throughout the Great Plains on farmlands attention is given to conservation cropping systems and to increasing or restoring soil fertility.

Summary

Wind erosion can be controlled if suitable combinations of practices are installed and maintained. Wind erosion will never be entirely eliminated from the Great Plains. Nevertheless, there are now conservation tools and practices available. Research on the problems and fundamentals of wind erosion and related aspects is moving forward at an increased tempo. More and more earnest farm and ranch cooperators are applying practices which they have learned are helping in subduing the effects of drouth and wind. ■

Effects of Forest on Runoff

HERBERT C. STOREY

THE EFFECT of the forest on runoff is dependent on the interrelationship of a large number of factors, including the type and condition of the forest, type and amount of precipitation, topography, soils and geology, and various elements of climate.

The forest differs significantly from other types of landscape. This difference is characterized by three significant elements. First, is the height of its foliage above the ground and the number of layers which compose the total thickness of this protective canopy or roof. Second, is the layer of fallen leaves and other debris on the ground surface constituting the forest floor. And finally, the distinctive soils that are formed beneath forests because of the unique effects of forests upon microclimate, moisture regime, organic matter supplied, and on the animal and plant life of soil layers. Water movement and water action are different in the forest because of the canopy, forest floor, and distinctive soils.

In order to better understand the effect of forests on runoff, it is necessary to consider the various processes that influence water movement from the time it is precipitated on a watershed until it leaves the area as streamflow or returns to the atmosphere through evaporative processes. Each of these processes may be modified to a major or minor degree by variations in the characteristic elements of the forest.

Interception

When water first strikes a forested watershed, a significant part of it will be retained by the tree canopy. Part of this water will be evaporated, part will drip from the leaves and twigs, and the remainder will run down the stems and trunks to the ground. The amount of moisture intercepted by the tree foliage and evaporated will vary depending upon the density, type, and height of the canopy.

Law (1) reported interception by a dense Sitka spruce plantation in England, consisting of trees 30 feet high, to be 14.63 inches or 38 per cent of the annual precipitation. This is considerably more than reported by Rowe and Colman (2) for an 80-year-old stand of ponderosa pine in the Sierra Nevada wherein interception was determined to be an average of 6 inches annually or 12 per cent of the average annual precipitation.

Wilm and Dunford (3) have shown that a lodgepole pine stand amounting to 11,900 board feet per acre intercepted over 7.5 inches of precipitation, whereas an adjacent stand that had been cut to 2,000 board feet per acre intercepted only 4 inches of precipitation.

The forest floor, in addition to furnishing a protective covering to the soil, also retains a certain amount of moisture that is evaporated. Rowe (4) reported the annual evaporation from an undisturbed forest floor 2.7 inches deep under a 70-year-old ponderosa pine stand to be about 2 inches of water. This loss, however, was more than compensated for by the reduction in evaporation from the underlying soil due to the covering of litter.

Infiltration

When water reaches the soil surface it may either enter the soil or flow off as surface runoff or overland flow. Infiltration is determined by the conditions at the immediate soil surface. Soils of coarse texture, or with fine particles held together into stable large aggregates have high infiltration rates. A complete litter layer under a forest effectively protects the soil beneath from raindrop impact, and prevents the clogging of large pore spaces by fine particles. This layer also furnishes food and protection to insects and animals which permeate the soil and bring about favorable conditions for the entrance of water. Passageways for water are the large pore spaces. Anything increasing their abundance and preventing their obstruction is favorable for infiltration.

Infiltration rates are unusually high under a tree cover where the forest floor layer is well developed. When the forest is disturbed by logging or grazing, or removed by fire, protection may be decreased sufficiently to cause surface runoff. In some situations, soil freezing may reduce infiltration under forests. Yet, when compared with areas in grass or bare soil when all other conditions are equal, infiltration is highest in the forest. The forest floor—not the canopy—is the part of the forest that affects infiltration, and hydrologic conditions can best be judged not from stand tables nor basal area but from the nature of the litter, humus, and surface soil layers.

Dunford (5) has presented the results of a study in Colorado showing that removing the litter under a ponderosa pine stand decreased the infiltration capacity to

Herbert C. Storey is Director, Division of Watershed Management Research, Forest Service, U. S. Department of Agriculture, Washington, D. C. *This is a revised version of a paper presented at the annual meeting of the Soil Conservation Society of America, Asheville, North Carolina, October 21, 1958.*

such extent that surface runoff was 7 times that from an adjacent, undisturbed area.

Soil Moisture—Storage and Movement

Water that has entered the soil may be in part retained and later returned to the atmosphere by evaporation or transpiration, or some may move laterally through the soil and emerge again in stream channels, or it may move on down through the soil and replenish ground-water supplies.

Approximately 50 to 60 per cent of the total volume of the soil is made up of voids or pore spaces filled with air or water. The size, shape, distribution, and continuity of the soil pores determine the rate at which water will move and the amount which will be held. Water that moves in the larger pores moves primarily by the action of gravity in saturated soil. Capillary forces move water in the small pores. The smallest pores hold water against gravitational forces and are emptied by evaporation or plant roots. Water so held does not contribute directly to streamflow or ground-water supplies, but it constitutes almost the entire moisture supply for upland vegetation. This form of storage is called retention storage, as distinguished from the temporary or detention storage within the larger pore spaces.

Water can move rapidly both parallel to the slope and vertically downward in the large voids. Where underlying soil horizons are dense, root channels may be the principal pathway for water movement. Gaiser (6) found more than 4,000 vertical channels per acre in a hardwood forest growing on silt loam soils in Ohio. These channels were formed by the decay of roots.

Hursh and Hoover (7) have shown the importance of lateral movement of water in the large pore spaces on sloping lands. Upon application of artificial rainfall at the rate of 1.6 inches per hour for 15 minutes, while only 2.5 per cent of the water applied ran off the surface, 12.5 per cent of the water moved downslope within the surface foot of soil. This subsurface lateral flow is an important component of the total runoff from natural forest soils. Water moving as subsurface flow is considerably delayed in reaching stream channels as related to overland flow. This is an important element in flood reduction, and further, subsurface water movement does not carry soil off the slopes.

In addition to forming passageways for rapid water movement, the large pore spaces provide an opportunity for temporary water storage. If water enters the soil faster than it can move into lower horizons, it is stored temporarily in the large pore spaces. Although the water is thus stored only temporarily, this form of storage is exceedingly important because it prolongs the period during which water can percolate into underlying strata, and it also provides emergency storage for water which would otherwise be forced to move over the soil surface. Thus detention storage capacity may be a very important item in controlling storm runoff.

Moisture that is held in the soil as retention storage may be removed by evaporation or transpiration. Transpiration is effective throughout the depth of root penetration, whereas evaporation occurs at the surface and then works progressively down into the soil. The amount of moisture removed by transpiration will vary according to a number of characteristics of the vegetation, one of the most important being depth of root development.

Forest Effects—Storm Runoff

Forest growth, by modifying or controlling processes that influence water movement in the watershed, may affect floods, and the timing or amount of water yield.

Floods are normally formed by the rapid concentration of storm water flowing over the land surface into stream channels. Therefore, the forest cover to reduce flood flows would have to prevent or retard this movement of water. This could be done by either holding the water back or by diverting it in other directions.

Numerous studies have shown that forest growth will intercept an appreciable amount of precipitation either on its foliage or on the litter covering the ground surface. Water thus retained is unavailable to augment surface runoff. Forest growth also retards snowmelt by shading the snow and by reducing wind velocities at the snow surface. Thus water is held in the snowpack and more slowly released to streamflow than is the case where forest growth has been removed.

Studies have also shown that the forest effectively develops and maintains a high infiltration capacity in the underlying soil. Thus, under a forest cover, precipitation may readily enter the soil, rather than flowing off the surface, thereby reducing flooding. This is true in most cases except in areas where the forest floor has been disturbed by road building, severe grazing use, skidding of logs, or fire.

In certain parts of the country, particularly in the Northeast, some floods have been caused by precipitation falling on impermeable frozen soil. But studies in this region (8) show that impermeable frozen soil occurs much less frequently and less extensively on undisturbed forest land than on open cropped or pastured areas. The infrequent occurrence of impermeable frost is particularly characteristic of undisturbed hardwood stands.

The forest is particularly effective in increasing permeability and the proportion of large pore spaces within the soil. This is important in the reduction of peak flows. Water that enters the soil must have storage space to move into and passageways to move down readily through the soil. In typical soils percolation rates and large pore spaces decrease rapidly with depth. However, deep root-

ing of trees and the activities of burrowing animals and other organisms are responsible for developing and maintaining the permeable characteristics of forest soils.

Schiff and Dreibelbis (9) have shown a significant difference between the rate of movement of water through forest soils as compared with that of cultivated soils in Ohio. Their measurements show the transmission rate of the surface soil in a forest area to be nearly twice that of a cultivated area, and the transmission rate of the subsoil in the forest area was five times that of the cultivated area. Thus precipitated water entering the soil in the forest area can move down through the soil profile much more rapidly than in the case of the cultivated area.

It should also be pointed out that the relatively large amount of large pore space in a forest floor provides a temporary storage place for storm water, thus further withholding water that might otherwise join flood flows. This detention storage frequently exceeds three inches in the surface foot of forest soils.

During the growing season forest growth removes water rapidly by transpiration throughout the entire root zone. This action serves to make more storage space available when the next storm comes along.

It should be borne in mind that the mere presence of trees does not necessarily signify the presence of conditions that would be expected to ameliorate flood flows. The forest floor of litter and decaying organic matter is an important element in the protection against overland flow. Timber harvesting methods that destroy large areas of this protective covering, together with ground fires and destructive grazing which bare the soil beneath the tree canopies, all serve to destroy the forest protective capacity against floods.

The Tennessee Valley Authority (10) has reported the results of reforestation and erosion control activities on the White Hollow Watershed—a 2.68 square-mile area in Tennessee. In 1936, 66 per cent of the area was in forest, 4 per cent was cultivated, 26 per cent was abandoned farm land, and 4 per cent was grassland. The forest area was in very poor shape due to heavy overcutting, unrestricted grazing of livestock and frequent forest fires. The stands were characterized by poor stocking and little litter on the ground. As a result of protection from fire and grazing, erosion control, and tree planting, the area was 100 per cent forested by 1946. Peak discharges during the summer season had been markedly reduced both in size and frequency. Discharge rates during storm periods were only 8 to 27 per cent of those for comparable storms prior to the establishment of improved conditions. Discharge of storm runoff was extended over a much longer period of time, thus tending to produce a more sustained flow.

Forest Effects—Water Yield

The role of forests in regard to water yields has not always been clearly understood by many people. Some enthusiasts have claimed that forests increase total water yield, but this is not borne out by studies of the place of forests in the water cycle. Raphael Zon (11) emphasized the need to distinguish clearly between the total annual discharge of a river and the actual behavior of the stream during the different seasons of the year. It is possible, for instance, for the total annual discharge to remain unchanged, while the stream regimen itself is so changed that the utility of the streamflow is greatly impaired. Carlos Bates (12), a noted pioneer in studies of forest influences, has pointed out that forests use water in large quantities, possibly in greater quantities than any other form of vegetation except deep-rooted perennial crops, such as alfalfa, but that a forest cover under certain conditions tends to equalize the runoff throughout the year, to increase the storage capacity of the watershed, and to reduce soil erosion.

Figure 1. A well-developed forest soil with a good protective cover of hardwood litter. Soils such as this provide ready opportunity for infiltration and storage of water.

Figure 2. Fool Creek watershed showing contour road system and alternate clearcut and uncut strips. Cut strips provide opportunity for increased snow accumulation and hence increased water yield.

Croft (13) has shown that the evapotranspiration loss from the riparian zone of Farmington Creek, Utah, is about one-third of the total flow during the late summer when need for water is greatest. He further points out that it may be economically feasible to increase water yields during this period of the year by reducing evapotranspiration losses through reduction of vegetation along stream courses or by piping water through the lower main channels.

Wilm and Dunford (3) have shown that heavy cutting in the lodgepole pine type of the Central Rocky Mountains resulted in an increase of water available for streamflow of over 3 inches annually, or some 31 per cent. This has been substantiated by further studies reported by Goodell (14) on the Fraser Experimental Forest in Colorado. A 714-acre watershed containing 550 acres of merchantable-size lodgepole pine, spruce and fir was logged in a pattern of alternate clear-cut and uncut strips. Altogether, 278 acres of the watershed was cleared. During the first two years following cutting, water yields were increased an average of about 25 per cent. Most of this increase was realized in the spring freshet but slightly higher flows were measured in summer and fall when water demands are highest.

From the foregoing it can be seen that forests do exert a considerable influence on runoff. The type and amount of influence will depend upon the type and condition of the forest. And it should be further emphasized that some characteristics desirable from the standpoint of reducing flood flows may not be compatible with maximum water yield objectives. Maximum flood control calls for the retention and dissipation of water in the watershed, whereas maximum water yield requires the reduction of evapotranspiration losses. Practical watershed management usually will consist of a compromise between these two conflicting objectives.

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Preliminary Geologic Site Examination in Watershed Planning

J. R. THOMPSON

GEOLOGY, as applied in engineering, is an integral part of the business of watershed planning. Elements of the science of geology enter into many of the facets of planning a watershed program. The science performs an important function in the problem of the analysis of foundations and other site factors at the locations of proposed floodwater retarding structures. Dams for retarding flood flow, where used, supply a high percentage of the benefits from the reduction of downstream damages. For this reason, detention dams are widely used in watershed protection programs of the Soil Conservation Service.

The purpose of the preliminary geologic site examination is to establish the geologic feasibility of the site and to provide a basis for planning detailed investigation. Geologic feasibility here implies that at a given location there are a combination of geologic conditions which will, to varying degrees be either beneficial or will adversely affect a particular construction job. This applies equally well to the effects on the surrounding area that might result if the construction work is done.

Conducting preliminary geologic site examination for a proposed structure is one of the functions of the geologist on the staff of the watershed planning party of the Soil Conservation Service. In the discussion that follows, an illustration is presented of a method used in preliminary examinations in Tennessee and other parts of the country. Actual cases will be cited to show the results of the examinations and to illustrate their utility.

The Geological Setting

As part of the preliminary examination and prior to the detailed field investigations at the location of the proposed structure, it is essential to assimilate pertinent information about the area in order to understand the broad geologic aspects. This information is obtained from available geological publications and maps. Appreciation of the broad geologic aspects of a watershed area has a definite purpose. From this understanding, specific geologic situation can be anticipated and thus helpful guide lines can be set to aid field investigations. The Lick Creek watershed in eastern Tennessee is herein used to illustrate this. (Lick Creek watershed includes about 168,000 acres. It is located northeast of Knoxville, near Greeneville, Tennessee.)

Lick Creek watershed lies in the part of the Appalachian region known as the Valley and Ridges Province. This province lies between the Blue Ridge and the Cumberland Plateau Provinces. It is characterized by series of long, parallel ridges lying in a northeast-southwest direction. The rock strata are strongly crumpled and folded with much fracture of the rock and displacement along shear planes (faults). Three physiographic subdivisions may be recognized within the watershed (Figure 1). The first subdivision includes the Bays Mountains which lie along the northwest side of the watershed. The second includes a belt of shale ridges and knobs that form a longitudinal strip through the watershed. The third subdivision includes limestone and dolomite hills that lie along the southeast side of the watershed. There are marked differences in elevation. The Bays Mountains rise to over 3,000 feet above sea level, the shale ridges lie at 1,200 to 1,300 feet, and the limestone-dolomite hills are 1,600 to 1,900 feet in elevation.

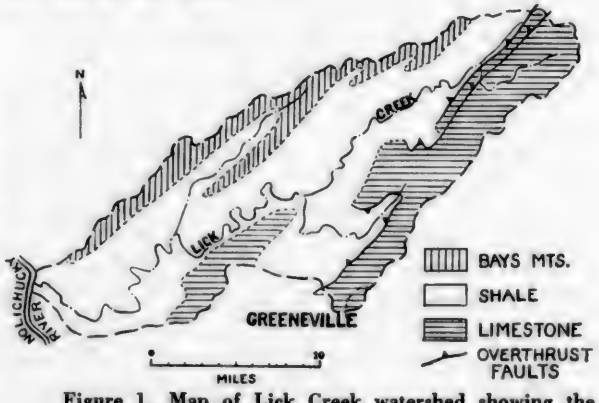

Figure 1. Map of Lick Creek watershed showing the physiographic subdivisions and the locations of the overthrust faults.

The entire upland is characteristically rugged terrain. The ridge tops in the Bays Mountains are nearly knife-edged, and in the shale belt the ridges are long, narrow spurs with round, knobby tops. The terrain in the lime-

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stone area consists of broad, arched ridges with intervening steep gorges. The rock strata within the watershed display the strongly crumpled and folded condition characteristic of the Valley and Ridge Province. The presence of complex rock fracture and displacement along shear planes is evident. Prominent features in the landscape are rocky escarpments created as a result of rock movement along lateral shear planes (overthrust faults). Examination of topographic sheets covering the limestone areas shows pitted topography which indicates an abundance of surface sink holes.

The geological maps and text descriptions indicate that the bedrock in the Lick Creek area is early Paleozoic age and is included within the Cambrian and Ordovician systems. The Bays formation, the Sevier shale, and the formations within the Knox group are predominant within the watershed. The Bays formation consists of shale, siltstone, and shaley limestone in its lower zones. The upper zone is dense sandstone which forms the ridge caps in the Bays Mountains. The Sevier shale is described as being silty to sandy shale. It is fissile, laminated or thinly bedded. The Knox group of formations is described as predominately massive bedded dolomite and limestone.

From the above brief summary of the geology of the Lick Creek watershed, some inferences may be drawn concerning specific geologic situations and problems to be anticipated. Their effect on the geologic feasibilty of proposed structures will vary.

The Shale Area. In the shale area, the presence of extensive rock fracture points out the possibility of open, ruptured zones in the shale which would allow excessive seepage in the foundation and abutment zones. Saturated fracture planes and weak bedding planes under the weight of an embankment may not have sufficient resistance to shear. Movement along these slippery surfaces could cause embankment failure. Folding and crumbling of the beds has left the rock strata with high angle dips. Careful observations should be made of the direction and angle of dip of the shale beds with reference to the orientation of the dam: Slumping of abutments and side slopes of emergency spillways could occur along "greasy" bedding planes.

Some preliminary attention should also be given to the nature of construction materials available. Two logical sources of fill are the upland residual soil materials and the flood plain alluvium. Will sufficient quantities of suitable materials be available? Also, since this is a shale area, do the materials appear to have sufficient gradation of particles size to meet requirements for embankment material? Excessive content of certain types of clay leads to problems in spreading and compacting the material in the embankment fill. The general description of the Sevier shale describes it as being "fissle, laminated or thinly bedded." This suggests that the shale may lend itself well to "ripping out" in excavations for emergency spillways. This is an important preliminary observation because of the great variation in cost of excavating different types of bedrock. There are a host of other problems encountered with shales that vary with their composition, cementation and structure. Most of these are beyond the scope of the preliminary geologic examination.

The Limestone Area. The extensive limestone-dolomite area within the Lick Creek watershed is described as being predominately massive bedded. A combination of complex rock fracture, strongly folded rock strata, and massive bedded limestone and dolomite leads to the conclusion that many cavernous solution zones can be anticipated. This conclusion is further substantiated by the apparent sink hole surface features observed on the topographic maps. The possible existence of cavernous conditions requires careful attention in locating structure sites. Open, cavernous rock in the foundation area of a dam can readily lead to embankment failure. Cavernous conditions within the basin area behind the dam can mean rapid loss of water. This would mean severe limitations in the usefulness of the reservoir for irrigation, water supply, or recreation, if so planned. The preliminary examination cannot reveal the extent of cavernous zones; however, their presence can often be confirmed by surface observations.

Examination of the topographic maps covering the limestone area shows that the valleys are narrow and gorge-like. This suggests other observations that should be made. A question is raised concerning the nature of the limestone slopes with reference to emergency spillway construction and problems of differential settlement of fill. Some limestones have a deeply weathered surface with thick layers of soil and loose rock. Whereas others have thin soil over dense rock. The latter condition is often present in steep-walled limestone valleys and heavy rock excavation is necessary for spillway construction and to shape abutments to prevent differential settlement of fill. The nature of the limestone slopes also relates to the problem of the availability of suitable quantities of materials for embankment construction. Also in this type of limestone valley, where stream gradients are high, fine-grained alluvial materials suitable for embankment construction are generally not found in sufficient quantities. Observations such as these are important in arriving at decisions as to the overall feasibility of structure sites and in developing cost estimates of proposed structures.

By examination of the general geologic features of the Lick Creek watershed, a list of geologic conditions which relate to the geologic feasibility of structure sites has been made. A summary of these will serve as a guide and will establish focal points upon which the field investigations should be centered.

Case Histories

Following are case histories of sites in the Lick Creek watershed where preliminary geologic examinations were made. These cases illustrate locations where anticipated geologic conditions were found and they demonstrate the utility of the examinations. In the interest of brevity, only the geologic conditions that illustrate the weakness of each site will be discussed.

Case A. This is a floodwater retarding structure that was tentatively located at a point along a valley where many of the essentials of a good site were met. It controlled a large drainage area, had good storage capacity, and would not disrupt existing roads or other fixed improvements. The preliminary examination revealed that most of the centerline of the proposed embankment and much of the basin area were lying on cavernous limestone. Figure 2A shows a cross-section of the valley along the centerline. The limestone rock strata are lying in nearly a vertical position. The outer sections of the centerline lie in shale.

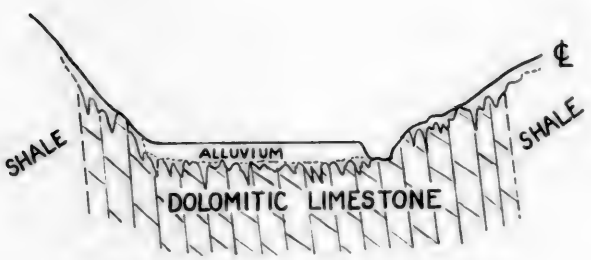

Figure 2A. Case A. Plan view of structure area.

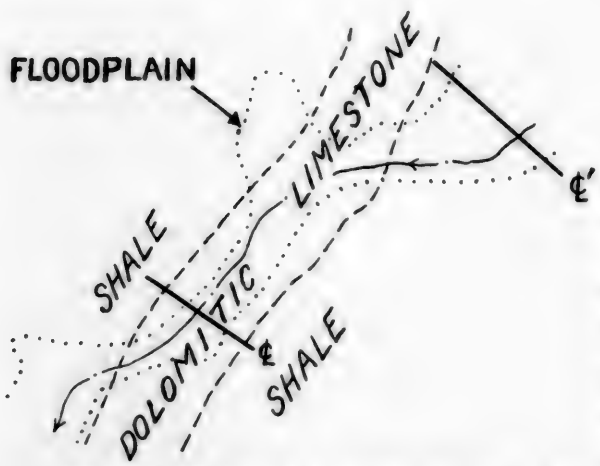

Figure 2B. The line C-L is original centerline of dam. The line C-L' is possible relocation site.

Figure 2B shows a plan view of the valley flood plain and the positions of the limestone and surrounding shale. The limestone is shown as a banded outcrop lying in a northeast-southwest direction. Numerous cavernous zones were observed along the limestone outcrop near the centerline and within the basin area. Fortunately the structure site may be relocated upstream several hundred yards to the area where the valley enters the shale. The valley widens in the shale and a longer dam will be required, but the desirable features of the original site are maintained. At the new site the uncertainties of a cavernous limestone foundation have been eliminated. Foundation grouting costs may be prohibitive at sites having such uncertainties.

Case B. At the proposed site of this floodwater retarding structure, the foundation and the entire basin area are in shale bedrock. The structure site met many of the criteria of a good location. Along the valley side slope in the vicinity of one of the abutments were a series of surface disturbances that appeared to be ordinary gullies. Close examination of these disturbances showed they were actually sluffs or slides of soil and shale material. Observations of the underlying exposed shales revealed that, in this segment of the valley, the shale beds were running parallel to the valley or at right angles to the centerline. The beds also had a high angle dip (55 degrees) heading into the valley (Figure 3).

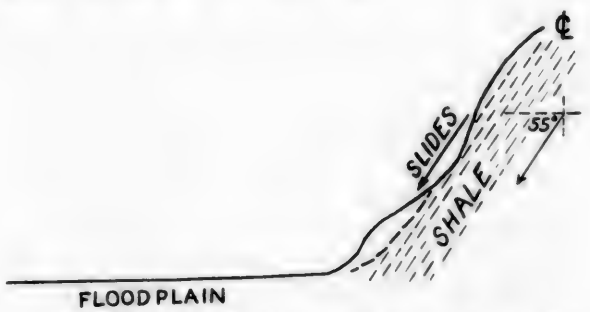

Figure 3. Case B. Abutment slope along centerline. Shale beds dip 55 degrees into the valley and are subjected to slides.

This abutment of the dam would be in jeopardy because the stability of the slope is highly questionable. If the slope were loaded with the weight of an embankment, failure of the abutment could easily occur along the bedding planes dipping into the valley. Because of considerations other than geologic, this site was abandoned. Had the site not been abandoned, the geologist would have recommended that the centerline be shifted to obtain more favorable orientation of the dam with the shale beds.

Case C. Certain proposed structures for retarding flood water are sometimes called "key dams," the structure in question is one of these. The dam will control

the runoff from an exceptionally large drainage area, good floodwater storage is available, and many other features are in its favor. The proposed design of the dam will be unique in that the drainage from a major tributary will be diverted into the basin behind the dam.

By locating the structure site on a geologic map, it became evident that design of part of the dam would require consideration of conditions associated with the leading edge of an overthrust fault (Figure 1). Field examinations showed that one of the abutments of the dam will lie in the steep, rocky escarpment created by the fault. Most of the flood plain section of the centerline of the dam and the entire abutment area on the opposite side will lie in shale. Figure 4 shows a cross-section of the valley. The left abutment slope is shown as massive dolomitic limestone with strongly dipping, highly fractured rock strata. Numerous cavernous zones are present. The centerline of the dam could not be moved more than a few hundred yards upstream or downstream without losing important advantages of the site. The fractured, rocky escarpment is extensive along the side of the valley and the geologic feasibility could not be enhanced by shifting the centerline. Thus the centerline was maintained in its original location with the understanding that considerable expense could be incurred in securing a solid abutment in the fractured limestone rock. Since this is a key dam in the system, it was felt that benefits would justify the additional cost. This is a case where the preliminary geologic examination pointed out conditions that will require intensive remedial foundation treatment if the structure is to be installed. From information such as this, more realistic cost estimates can be made to assure economic feasibility.

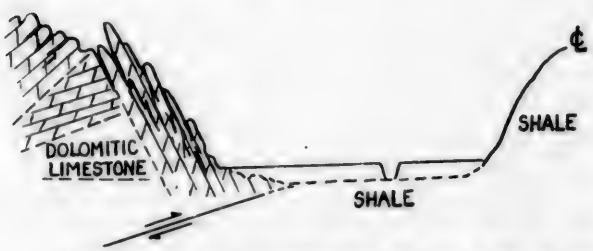

Figure 4. Case C. Cross-section of the valley at the centerline. Left abutment is highly fractured, strongly dipping cavernous dolomitic limestone. Relative movement along overthrust fault is shown. Such sites cannot be recommended by the geologist for development.

These case histories are intended to illustrate how the preliminary geologic examinations are a determining factor in structure site locations and in arriving at cost estimates. Over 40 proposed structure sites were investigated in the Lick Creek watershed. As a result of these investigations, numerous sites were relocated. The majority of the sites appeared to be geologically feasible. It should be emphasized that many questions remain to be answered about a structure site after the preliminary examination is made. Only under unusual circumstances, such as small dams in areas where previous knowledge and experience is available, can the preliminary examinations constitute the entire geologic investigation. Generally, sufficient data to fulfill design and construction requirements can only be obtained by detailed subsurface investigations, field testing and analyses by the soil mechanics laboratory.

Summary

The overall purpose of preliminary geologic examinations is to establish the geologic feasibility of structure sites, to provide a basis for planning detailed investigations, and to eliminate in the early stages of a watershed project as many uncertainties as possible.

It is important to review pertinent information about the watershed area in order to gain an appreciation of the broad geological aspects. From this, a summary of anticipated, specific geologic conditions can be made and this will serve as a guide for intensity of field investigations. The results of preliminary geologic examination of Lick Creek watershed in eastern Tennessee is used to illustrate this.

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Water Resources

LAWRENCE G. HINES

Problems in the Analysis of Development and Use in the United States

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Because of the sometimes dramatic and newsworthy nature of community water shortages and agricultural droughts, most individuals are aware of the critical water deficiencies that have occurred in the past in the United States. Shortages may be expected under certain conditions to be repeated in the future.

The seriousness of the problem together with public awareness—at times resulting from intimate experience with water shortages or deterioration in water quality—has stimulated widespread water programs at all levels of government: local expansion of community water supplies, state systems of control and improvement, and Federal programs for development of existing water resources.

> "Recent rapid growth in the engineering works designed to increase the usefulness of water has brought the volume of public and private expenditures for the development and control of this resource to a magnitude far in excess of that for any other resource and, for the Federal Government, even beyond the total of all other resources combined."—J. R. Mahoney, "Essential Features of the National Water Resources Basic-Data Program," *Program to Strengthen Scientific Foundation in Natural Resources* (Washington, D. C.: House Document 706, 81st Congress, 2nd Session, November 1950), p. 61.

I. The Need for Basic Data

The major demands for water in the United States arise for community water supply, industrial requirements and agricultural needs. There are varied recreational activities dependent upon extensive areas of unpolluted surface waters. These water uses exhibit different quantitative requirements and dissimilar worth in private and social return.

The need to choose among various water uses arises when water is not sufficiently abundant to permit unlimited satisfaction of all demands. The recent increased demand for water in the United States poses intricate and illusive problems of development and exploitation of various water sources. But before the social and economic problems that arise from increased water demand can be adequately considered, additional knowledge of the physical and technical characteristics of water supply must be collected and analyzed.

Although our water supply is obtained from either surface or ground sources, even in the case of the abundant surface waters, physical data are fragmentary and incomplete. Precipitation statistics, for example, are recorded with reasonable adequacy for selected regions, but information on total catchment areas or drainage basins is far from complete *(House Document 706)*. In like manner, stream runoff data have been systematically collected, but generally only for the larger rivers and streams. Knowledge of smaller tributaries, which are increasingly selected as sites for water development projects, covers such a limited time period that the reliability of the data is subject to serious question. Engineering plans and economic studies that are based on such data run the risk of either overdesign or inadequacy. There is waste from overdesign or failure from inadequacy if either extreme is chosen.

Research in evapotranspiration requires more than the collection of statistics. The loss of moisture to the air through plant transpiration varies from region to region and in some cases may exceed runoff to the ocean. Our understanding of the process of evapotranspiration on basin water supplies is slight except in very general terms. Extensive research is needed to determine the effects of different physical structures, plants, and locations upon the return of water to the atmosphere in order to determine the suitability of different river basin areas for water resource projects.

As a consequence of increasing population, industrial growth, and expansion of irrigation, the future water supply of the United States will be subject to rising pressures of depletion and deterioration.

Water is still an abundant, low-cost natural resource. Water has an unrivaled capacity for replenishment through the hydrologic cycle and quality rejuvenation through natural stream purification and artificial treatment. But increased demand for water has already placed a strain upon the water supplies of some areas. This pressure seems likely to spread to other regions in

the future. As the supply of water in the United States is used more intensively, and the load of pollution from municipal, industrial, and agricultural sources increases, the re-use of water becomes the most likely way to satisfy increasing water need.

Unlike most resources, water is not necessarily consumed or depleted by an original use. For many purposes water may be repeatedly re-used if properly treated and if the dissolved solids content is low. As a result, water supply is greater than annual rainfall or the impounded stock at any point of time. The effective water supply is a function of the quantity and the rapidity of its use (re-use), which in turns depends upon the degree of pollution and the speed with which recovery from deterioration takes place. Statistics of water use and water supply reported in "acre feet," such as annual rainfall figures, are essential physical bench marks, but do not reveal the optimum carrying capacity of a given quantity of water. Just as a given quantity of money will support a larger volume of economic activity if the velocity of circulation of money is high, so more extensive industrial, agricultural, and recreational activity can be attained through greater re-use of a given supply of water.

To determine accurately how much water is available to meet the growth needs of the American economy, a simple and reliable means of determining the quality of used water is of equal importance with measuring the quantity of virgin water. More intensive use of our streams and rivers for waste disposal has resulted from the growth and concentration of population. New and difficult-to-treat waste substances have been added by industry and agriculture to the familiar kinds of water pollutants. Changing agricultural technology, involving increased use of commercial fertilizers and pesticides of great but sometimes unknown toxicity, add problems out of proportion to an increase in the pollution load.

The commonly-employed indicator of water quality deterioration, which correlates pollution load with the consumption of dissolved oxygen, does not provide a reliable indication of the presence of some of the newer synthetic organic chemical wastes and radioactive substances. New and specialized techniques of measurement and treatment of water must be developed before we can know the precise quality of our water and restore it to something of its original usefulness.

In the field of national water pollution control, the U. S. Public Health Service has pioneered in the development of techniques for the identification and measurement of water pollution. The PHS has recently undertaken an expanded program in the collection of data on the extent of water pollution in the United States. Basic data on municipal and industrial waste treatment facilities are now in press and a nation-wide network of water quality sampling stations has been established. These collection stations will employ the latest techniques in measuring and recording the nature and extent of various water pollutants. At the same time the PHS has given increased attention to technical problems and has under design an instrument to determine and record continuously the dissolved oxygen content of a given water supply.

Since gross statistics on aggregate national water supply and demand may conceal local or regional differences, these data will be most useful if recorded in terms of river basin or catchment areas. The contemplated 300 Public Health Service sampling stations, which in the future may be augmented by a more extensive network of state stations, should over the years provide vital information on the presently unknown or indefinite status of water quality. If the data on water pollution are sufficiently complete, an "index of national water pollution" may be derived. Such an index would be similar to the Federal Reserve Board's *Index of Industrial Production* or the Department of Commerce's *Gross National Product and National Income*. A water pollution index would provide the same essential information for broad natural resource planning that the Federal Reserve and Commerce statistics contribute to the formulation of national monetary and fiscal policies.

II. Problems of Economic Growth

Deficiency in basic data is only part of the larger problem of inadequate knowledge of water resources. Water control and development projects have not only raised perplexing technical questions, but have created new social and economic problems. Water impoundment for irrigation, flood control, and navigation, for example, has at times radically altered the character of stream flow. Water quality process has also been adversely affected through impairment of the natural self-purification.

Research on problems of water quality deterioration, many of which result from man's modification of his environment, is one of the major responsibilities of the U. S. Public Health Service's Taft Sanitary Engineering Center. At the present time the Center is investigating the extent to which dissolved oxygen is depleted in lower strata of impounded waters and the effects upon stream self-purification resulting from the construction of dams and the intermittent operation of hydroelectric installations.

The rapid expansion of some industries, such as the petro-chemical industry, and the widespread recent use of new products, such as detergents and insecticides, have posed difficult problems both of pollution and analysis and waste treatment. The effects of various quantities and combinations of many new waste materials are vir-

tually unknown. For others, although knowledge of the nature of the harmfulness may be established in the laboratory, it is too soon to be certain of the full range of potential reactions under stream environment conditions.

Ultimately to cope with the developments of modern industry, it will be necessary (1) to compile a reliable catalog of the pollutants in our streams and to determine the characteristics of the myriad combinations that occur from the intermingling of different wastes; (2) to develop techniques for reliable measurement of the pollutants; and (3) to perfect treatment methods that eliminate or render harmless the injurious substances.

As the long-term demand for water increases, the development of new sources of supply raises some problems that are familiar and others that are new. Subsurface ground water and distant surface supplies are the most apparent sources of additional supply. The former requires drilling and sometimes pumping expenditures. Pumping involves conveyance costs. As surface water use increases to maximum, the exploitation of ground water becomes economically feasible. Actually, unless over-depleted, ground water is a more stable and satisfactory water supply in most cases than surface water. Ground deposits are subject to less intermittence in supply, smaller flow and temperature variation from seasonal influence, and are generally of higher quality. Unfortunately, data on ground water are virtually nonexistent except for scattered clusters of information (see H. E. Thomas, *The Conservation of Ground Water*. New York: McGraw-Hill, 1951).

The characteristics of ground water are roughly similar from one region to another. It is incorrect, however, to assume that a more or less continuous deposit of water underlies most of the United States. The nature and extent of underground water deposits varies greatly from region to region. What is a satisfactory, non-depletive rate of withdrawal in one area may endanger the long-run supply in another area. Basic information on the nature of ground water supplies is a first essential to rational water use. To obtain such information, much geophysical and engineering work remains to be done, and only upon its completion can optimum withdrawal rates and conservation practices be determined.

III. Possibilities for Adjusting Need and Resources

On the demand side, virtually all predictions and projections point to increased use of water in the United States, largely as a result of population growth and industrial and agricultural developments. But it is not enough to know that water requirements will rise in the future. In order to determine accurately society's future water needs and appraise the adequacy of existing sources, more nearly complete knowledge of the nature of water requirements is essential. Technological modifications in the industrial process and the development of new products have progressively increased the burden upon existing water resources in most instances in the past. Developments in water re-use may somewhat temper the rising curve of demand.

In areas where water supply has been limited, restrictive prohibitions or high water costs may bring about striking economies or conservation in the use of water by otherwise high-consumption industries. Probably the most frequent cited examples of industrial water savings are the Kaiser Steel Plant at Fontana, California, the Hiram Walker Distillery at Peoria, Illinois, and the Bethlehem Steel Plant at Sparrow's Point, Maryland. It may be uneconomical for all industrial plants to undertake the same water economy programs required in the above water-short plants. Nevertheless, the unusual water savings made in these cases indicate the responsiveness of the water user to higher water costs (restricted supply) and the flexibility of water requirements for some industrial processes. Development of greater efficiency in the use of irrigational water may also afford an important means of stretching a given water supply over more output.

We are not without information on the range of water requirements for many industrial processes. Plant variations, as great as fifty-fold occurring in the same process, indicate the need for additional study in this field. Such variations are not entirely an indication of the extent of possible water savings, but also reflect different product complexes of plants producing essentially the same commodities.

(The U. S. Geological Survey is engaged in a series of studies of future water requirements of selected industries in the the United States. To date papers on the following industries have been published: pulp and paper, carbon-black, aluminum, Rayon- and Acetate-fiber. Washington: Government Printing Office, Geological Survey Water-Supply Papers 1330-A, 1330-B, 1330-C, 1330-D. A more general study, *Water in Industry*, was published in 1950 by the National Association of Manufacturers and the Conservation Foundation. See also "Water Use in Selected Manufacturing Industries, 1953," *Annual Survey of Manufacturers*, reported in *Statistical Abstract of the United States*, 1957, p. 802.)

IV. The Enlarging Social Consideration

In order to determine the adequacy of existing water resources for future needs, the reaction of water users to price change must be known. There is significant but inconclusive evidence that some industrial processes permit wide tolerance in the amount and quality of water that can be used. Further research is needed to establish the reaction of the producer to cost (price) changes for water.

The references to the price of water in the above paragraphs indicate the recurring importance of economic and

social factors in the optimum use of water resources. As long as the water resources of the United States were sufficiently ample and the charge for water was a minor financial outlay, the problem of "allocating" water to different uses did not occur. Almost any water use could be satisfied reasonably well without depriving other uses of water. The relative abundance of water, partly indicated by the low price, led to the then-justified assumption that water was virtually a free good.

Demands have increased. Water supply remains approximately unchanged (or actually deteriorates from pollution). Water resources have acquired some of the characteristics of a "scarce" commodity, raising problems of choice among alternative uses. *Here is the essence of the economic problem* which becomes more closely associated with the use of water in the United States as population increases and the demands of industry, agriculture, and recreation multiply.

Most natural resources are privately owned and the process of valuation and allocation falls neatly within the scope of the market economy. Water is a kind of economic-social hybrid: although water is distributed at specified rates, prices for household and industrial use are almost always publicly-determined. Irrigation water charges may at times not cover full costs. The public character of water price determination, together with the overlapping use of surface waters as a source of water supply and a vehicle for waste disposal, raises new and complex problems of social costs.

"Social" costs occur when the activities of a private producer impose upon the community (or another individual) an economic burden. The result is the impairment of public welfare in some way which may lead to increased expenditures by the community in order to eliminate the inconvenience — an example is noxious smoke or smog. An illustration of social costs—the inconvenience of the public by private activity—occurs in the dual and antagonistic uses of water for human consumption and industrial waste disposal. Waste pollution of water may raise significantly the costs of water treatment to insure a standard of water quality consistent with human consumption. Thus one of the "costs" of private production is shifted to the public.

Extensive treatment of highly polluted water may yield water safe for human ingestion. Other water uses—such as swimming, fishing, and boating, which generally require high-quality stream conditions—may be greatly impaired or completely destroyed. The consequence is a loss to the community of the use of an important recreational resource. At the same time, private commercial undertakings requiring large amounts of high-quality process water may be economically burdened by the waste disposal practices of municipalities and private firms, irrespective of whether the firm requiring high-quality water obtains its supply from municipal or self-supplied sources. The problem that confronts the social scientist is to determine the nature of the inter-relationships between private producers and the community. He must also devise measures of the extent of the burden that is shifted from one part of our society to another.

The application of the concept of social cost to resource problems has been neglected by economists. There is also the impressively difficult problem of measuring such costs after their existence and extent of influence has been determined. Economists are inclined to avoid such problems of measurement. If cost and value data are not available as a by-product of market price determination, economists are not easily persuaded to adopt other measures or indexes.

There are unique institutional arrangements surrounding the allocation of water resources. A price-theory or market-economy determination of water value is not likely to reflect the total worth of this resource. Moreover, certain water uses—especially so-called recreational activities—may not be expressed satisfactorily through the market mechanism of the private economy. An independent means of determining the value of water resource use in different activities may be required. If these independent evaluations can be expressed in comparable measures, such as dollar units, the choice between superior and inferior resource uses will be greatly simplified.

The first step in attaining optimum water resource use is, therefore, an accurate and comprehensive measure of the value of water in *all* uses. To the extent that the present structure of water prices does not reflect the full worth of some uses and avoids measuring others, the pattern of water resources allocation in the United States falls short of maximizing national output and individual satisfactions. But the use of such short-hand expressions is dangerous. Non-specific objectives, such as "equitable resource distribution," "optimum" and "maximum" output, contain built-in sanction and encourage assent through the apparent conformity with "just" or "right!" Two independent but related features of policy determination must be examined separately:

- Research is needed to determine (1) whether the existing arrangements of water resource allocation conform to stated goals and (2) whether selected goals are most suitable in given circumstances.

- The second assignment—examination of the appropriateness of goals—strictly speaking falls outside the province of both the natural and social sciences.

Economists in particular are loath to abandon the orthodoxy of the market place to appraise the worth of

a resource such as water or an activity such as recreation. This must be done, however, in a comprehensive examination of the goals of our economy and society.

The determination of the value of water resources is a clear responsibility of the economist. The lack of market data for some water uses and the questionable nature of information on other uses seriously impair the usefulness of prescriptions based upon these data. Unfortunately economists have no unique technique for measuring or quantifying intangibles and have generally shown less imagination than other social scientists in devising methods to secure information from non-market sources. Largely because of the usual excellence of market data, the economist has not relied upon special measurement techniques. At the same time, adherence to uncorrected market data has sometimes been the result of a misapprehension that objectivity is attained only when a study or observation avoids other sources of information.

In cases where resource use involves activities that take place outside the market process, however, extra-market appraisal is necessary to encompass the full range of resource worth. Two approaches are possible to supplement incomplete or unsatisfactory market appraisal: (1) indirect measures of resource worth and (2) independent, non-market appraisal of resource worth.

Some uses of water resources do not easily lend themselves to quantification and measurement in the normal operation of the private economy. In an attempt to bridge this "analytical gap," the "total expenditures" approach has sometimes been employed to indicate the importance—if not the precise value—of resources employed in collective or non-private activities. Frequently such studies are made to show the nature of tourist expenditures within a state and to indicate the importance of such traffic to the economic well-being of a given region. Water resources are usually of considerable importance in attracting the tourist, camper and fisherman. An indication of the worth of water resources may be inferred from the expenditures made in pursuit of certain recreational experiences. Unfortunately, such studies are generally not designed to measure the worth of a single resource and therefore are subject to error of overstatement, or understatement, depending upon the primary objective of the study. It is possible that careful research design may produce more specialized information on the worth of water in non-market uses. For such information to be most significant, the data should be in terms of dollars to assist decision-making where investment of public funds is contemplated and where competing uses of water impose a choice decision that excludes some uses.

A somewhat commonplace method of evaluating the worth of water resources in non-private use might employ a modification of the "consumer survey" approach to obtain an expression of collective demand. The difficulties inherent in such an approach are impressive and quite possibly insurmountable. The ideal result is a cardinal ranking of various water uses. To obtain such a ranking may require that the consumer be able to answer, at least approximately, what he would be willing to pay for different water qualities that are required for various uses. There are difficulties inherent in the sampling process and the frequent inadequacy of consumer knowledge. Under the artificialities of questionnaire conditions, the individual may not be able to make comparisons of the resource uses. The "consumer survey" may impose too great a burden of conceptualization. Individuals ordinarily may not be able to give realistic answers to evaluative questions unless they are confronted by an actual, self-imposed choice in the outlay of their income. By cross-checking techniques, however, consumer survey studies may be corrected for clearly erroneous expressions. The accuracy of the findings that remain may require further qualifications and correction.

Imperfect comparability of reactions, a major disadvantage of market data, is also present in the results of the consumer survey. Different individuals express dissimilar evaluations by the same x-dollar expenditure or the assessment of x-dollar worth to a given resource use. This difference is an inescapable result of the underlying pattern of income distribution in our society. If the consumer survey is based upon a representative income sample of our society, one can only conclude that the answers reflect the income position of those questioned. For this reason, it is not possible to conclude that the evaluations constitute either economic or ethical wisdom. For example, the lower-income individual may not appraise at such a high figure as the wealthy individual what he would be willing (able) to pay for, say, recreational use of water resources. The rich, on the other hand, may be able to appraise public recreational use at a high figure, but because of alternative private recreational opportunities will not do so. The worth of public resource use may therefore be recorded lower than public welfare warrants.

* * *

The conclusion is clear. Social and economic investigations require more than a simple recording of individuals' evaluations—even when these evaluations are accurate and well-informed. An examination of the background against which evaluations have been expressed and an independent validation of public policy goals are necessary. ■

Vegetating Critical Areas

GEORGE HOLMBERG

EROSION CONTROL work is going to grass in Iowa's Little Sioux watershed—or more accurately to grass and legumes. The new grass program, teamed with terracing, mulch growing and increased use of fertilizer, is helping farmers cut costs. With runoff reduced, only about half as many structures are needed as formerly.

The Little Sioux originates in Nobles and Jackson Counties in Minnesota and empties into the Missouri River at a point about midway between Sioux City and Omaha. Loess soils cover the lower two-thirds of this 4,500 square mile watershed. In the upper third the soils are of glacial origin. Here the topography is level to gently rolling with much of the area having drainage problems.

The most serious erosion problem is the erosive upland soils of the lower third of the watershed. In this hilly area the coarse loess ranges from 25 to more than 50 feet deep. Gullies frequently develop to depths of 50 feet or more. Slopes usually range from 5 to 25 per cent but some are steeper than 50 per cent. Without soil and water conservation measures annual soil losses on row crop areas are often 80 to 100 tons per acre. Annual rainfall in the watershed is from 25 to 28 inches.

The author is Management Agronomist for the U. S. Soil Conservation Service at Sioux City, Iowa. In this "how-to-do-it" article the author describes efforts that have been tested and applied in the Little Sioux Watershed which began operations in 1946.

The establishment and maintenance of vegetative cover on dams, basin terraces, borrow areas, waterways and floodways, involves many different techniques. The methods must be easily applied, effective, and economical.

● *Growing Mulch.* Because of the high cost of applying mulch, a method of growing mulch was developed. This costs $6 to $7 per acre, just 10 per cent of the cost of applying mulch.

The mulch is grown by seeding oats or rye with a permanent grass-legume mixture as a companion crop. Oats are used as a companion crop in the spring and rye in the fall. The grain is mowed before it heads out. The stubble helps hold the mulch in place. During adverse seasons for permanent grass-legume seedings the stabilizing crop is seeded, and the alfalfa-bromegrass is seeded in the residue of the stabilizing crop the following spring or fall.

● *Fertilizing.* Most subsoil areas, which must be vegetated, are very low in nitrogen and phosphate. On poorer areas, 600 pounds of 8-32-0 per acre or equivalent is

Figure 1 (*above*). Good vegetative cover established on a basin terrace. These are large level terraces established below steep areas (over 20% slope) in permanent vegetation.

Figure 2 (*below*). Upper reaches of a subwatershed in the Little Sioux project showing various critical areas to be vegetated.

Figure 3. On a critical area rye is grown and will be used for mulch. Reed canary grass is established around pond shore for wave-action control.

Figure 4. Planting reed canary hay in a wet waterway, formerly a gully, where this grass could not be established by seeding.

used. On better areas, 400 pounds of 8-32-0 or equivalent is used. This high rate of phosphate application is essential for best establishment of permanent cover. Initial nitrogen costs are reduced by using alfalfa-bromegrass in the seeding mixture. The alfalfa feeds nitrogen to the bromegrass, thereby reducing the amount needed in the first application. The alfalfa also provides early cover on the area while the bromegrass is being established. Bromegrass, being a good sod-former, fills in gradually when the alfalfa dies out.

● *Temporary diversions* have helped establish vegetation on critical areas, and at the same time have reduced the cost of reseeding. It has been possible to establish vegetation on some areas by using temporary diversions which would otherwise have had to be sodded. Sodding is very expensive compared to seeding. Seeding and temporary diversions are being used wherever possible. After seedings are established, the temporary diversions are bladed out.

● *Level terraces* are established on raw subsoil borrow areas located on hillsides before attempting to establish vegetation. Without these terraces, rills may develop up to 6 feet deep in one year on the very erosive Ida subsoils often used for borrow for the large dams. Reseeding and reworking costs are held to a minimum by building these terraces before trying to establish vegetation.

● *Reed canary grass* is used in wet waterways and around ponds for wave-action control. It is well adapted to these wet conditions. In many cases it grows more than 6 feet tall. It will withstand heavy silting. It will also heal over after small rills have developed in a waterway.

In the Little Sioux Watershed reed canary grass is broadcast in the wet waterways after other seeding has

Figure 5. A bare subsoil borrow area before vegetation was established. Borrow areas and cut slopes of basin terraces are the more difficult critical areas to vegetate.

Figure 6. Fertilizing and seeding a grass waterway in a Little Sioux subwatershed. Many of the techniques used are now being subjected to cost analyses measured against desired results.

Figure 7 (*above*). Vegetation established on a dam and around a pond. This man-modified landscape shows several high-quality environmental conservation practices. Figure 8 (*below*). Cropland level terraces and dams after several large rains in the watershed. In background, the flooded Little Sioux River appears.

been completed. It is seeded at the rate of 12 pounds per acre and gives good cover in one to two years. Where reed canary cannot be established by seeding or where a very quick cover is essential, reed canary hay is planted. Green reed canary hay is mowed and planted the same day. It can be spread with pitchforks and planted by tramping the stems in the mud or by covering the stems wtih a light covering of soil. Where the soil is not quite so soft, a crawler-type tractor may be used to push the stems into the soil. In a week's time plants start to grow from the nodes and at the end of a month plants will grow 6 inches with roots going down 6 to 8 inches in the soil. To shorten hauls the location of reed canary sod banks are planned in advance so that a reed canary hay source is as close as possible to the watershed where it will be used. Where reed canary is not available, sod banks have been established in cooperation with the State Highway Commission. The Soil Conservation Service, cooperating with Soil Conservation Districts, has established reed canary banks along highways on borrow areas of the road. These are used later for hay planting. Reed canary hay planting has proved superior to sprigging for a quick and effective reed canary sod cover.

● *Vegetative Management.* Small rills which develop while seedings are becoming established are not difficult to heal. With an alfalfa-bromegrass mixture they heal over in a short time providing the area is protected from grazing. Newly seeded critical areas should not be grazed the first year after seeding. And after a year, grazing should be controlled to maintain a good cover. On the more critical areas frequently applications of fertilizer are necessary to maintain a vigorous sod cover.

Alfalfa-bromegrass has been the most successful cover on the more droughty critical areas in the watershed. Reed canary grass has been best on wetter sites.

Agronomy field trials are carried out to determine the most economical and effective method of establishing vegetation. Krilium, asphalt spray, polyethylene film, mulching, and companion crops have been tried to determine their effectiveness for erosion control. Various native grass and tame grass mixtures have been tested. The effect of various fertilizer rates and combinations on establishing vegetative cover has been studied. Trials are also being carried out to study the effect on the amount of cover produced by various rates of seeding of different to the local SCS technical guide.

Additional trials will be carried out in the future as needed to adopt new and better agronomic methods for establishment and management of cover on the critical areas. The agronomy field trials are cooperatively conducted by the Soil Conservation Service, Agriculture Research Service and Iowa State College. When a practice has been proved applicable under local conditions, it is added to the local SCS technical guide. ■

South Dakota Vignettes

JOHN T. LOUCKS

RAPID CITY—This is the once-wild land of the Sioux and Cheyennes, the skilled hunters and the proud, courageous fighting men. Dakota is an Indian word meaning "friend".

It is the land of the Black Hills, a 125-mile-long platter of rocks and trees, which to the Red men was sacred land.

Across this land ranged the vast herds of bison—which got to be called buffalo—and the antelope and deer, feeding on the rich, strength-giving vegetation of the highly-fertile plains.

Across this land roamed the Indian nomads, traveling light and living on the wild game. They built homes of skins stretched on the long lengths of the lodgepole pine, and their "trailers" were two poles, called a *travois*, dragging behind a wiry pony.

It is the land of Wild Bill Hickok, who was holding aces and eights when he died, and of Calamity Jane and the other stalwarts who may have been gilded more by fiction and fancy than by fact.

IN THE PLAINS the native grasses important to South Dakota stockmen are western wheatgrass, grama grass, big and little bluestem, green needlegrass, needle and thread grass, blue and sideoats grama and the colorful buffalo grass.

In the higher hills, the useful species are little bluestem, Richardson and Columbia needlegrass, mountain rice grass and prairie dew seed. Where the bluestems are over-used, Kentucky bluegrass takes over as an invader.

WINDBREAKS are a major conservation measure throughout South Dakota's northern Plains. Varieties best adapted are cottonwood, Chinese and American elm, green ash, Russian olive, lilac, Nanking and sand cherry, plum and red cedar. The windbreaks may vary from one to a score of rows. Clean cultivation, to save on moisture, is important. Much of the fruit produced in windbreaks is canned or made into delicious preserves.

THE BLACK HILLS NATIONAL FOREST is 80 per cent ponderosa pine, five per cent white spruce; the balance is aspen, paper birch, with bur oak at the lower elevations.

Foresters say the ponderosa pine in this forest has the most rapid rate of reproduction of all the ponderosa forests. This is because rain usually comes in a pattern favorable to the germination of seeds.

The forest supports a rapidly growing pulpwood industry. A Wisconsin mill last year took 20,000 cords. Sawmills are thriving. Milled lumber is sold as far away as Iowa.

The porcupine is a principal trouble-maker in the Black Hills forest. He climbs the tall pines and girdles them. Porcupines do not increase in numbers rapidly, but a kindly attitude toward these bark-loving creatures protects them. Settlers held they represented a square and timely meal for a hungry man lost in the woods. There seems to be no report of anyone lost having dined on porcupine in recent years.

"By the time lumbering became active in the Hills, barring the logging operations of the miners, the idea of harvesting instead of mining lumber was coming into being. The Hills was one of the pioneer areas in this conservation method of woodland use."

FARMERS AND RANCHERS have built 90,000 stockwater dams in South Dakota. They have used about all the available sites and still they need more water. This is why the "dugout" has been coming into widespread use in the state as a water-conservation practice. Dugouts are scooped-out water holes in flattish land, sometimes with diversions to guide water into them. Many a stockman has found his stock dams and dugouts money-savers in dry years.

IF you are lucky you'll run into a honey-haired bundle of conservation spirit and energy named Martha Smith. She hails from Fairburn community 25 miles south of Rapid City.

Martha Smith came home on furlough as an Army nurse one day and found her home village in a predicament. The water wells were playing out. A look-round showed the trouble— sink holes were robbing the groundwater supply that was supported by French Creek. An unrelenting campaign produced a $40,000 state appropriation to mend the trouble. A pipeline from French Creek across a fissured area was a part of the repair work.

The Custer County Soil Conservation District dedicated its annual report to Conservationist Martha Smith.

THE WHITE RIVER BADLANDS of South Dakota are a fascinating area for geological study. Millions of years ago this was the home of rhinoceroses, crocodiles and turtles, herds of ancestral horses that had several toes, small humpless camels and deer. There were large trees and expanses of savannah and marshland.

Then the earth shrugged and its surface wrinkled and folded. Wind and water erosion played their part. Now from the jagged spires and ridges one can read an absorbing story of the earth and life forms that lived here, by turning up their fossilized bones.

The Indians later called this weird land "Mako Sica", their term for bad lands. The French trappers gave it a like name: "Mauvaises Terres."

The Badlands were homesteaded in settlement days. Much of the area is grassland and some of the ranches still have goodsized herds. The Badlands National Monument was established January 25, 1939. It is 60 miles long and up to 15 miles wide.

The late Frank Lloyd Wright, world-famous architect, once stated that the Dakota Badlands were a place of great inspiration to him in his work—that here was a myriad of forms and countless color combinations.

POSTMASTER George Lampert of Rapid City reports requests by the pouch full have been pouring in for the new commemorative soil conservation stamp which will be inaugurated the first day of the SCSA Convention. The postoffice will do a rushing business at stamp windows that day. Two special Washington representatives of the Post Office Department will be on hand, and Postmaster Lampert expects to add 100 extra employees for the rush.

Don't fail to send in that "official" first-day cover which has been distributed to each SCSA member. Its philatelic value will increase with the years. Send it to Rapid City.

Mount Rushmore National Monument will draw you deeper into the Black Hills. Here sculpted on the face of a mountain 6,000 feet high is the last and greatest work of Gutzon Borglum.

Sagebrush or Grass?

GEOFFREY E. GREENE AND W. R. ALDWORTH

Geofrey E. Greene is Range Conservationist, USDA Forest Service, Northern Region, with headquarters in Spokane, Washington. W. R. Aldworth is Farm Service Advisor, Farmers Union Central Exchange with office in Billings, Montana.

REMOVAL of big sagebrush (*Artemesia tridentata*) promises to be an effective practice for bettering the range in the Crow Creek area of the Townsend Ranger District, Helena National Forest. The Crow Creek range is situated in the Elkhorn Mountains about 15 miles west of Townsend, Montana. On this area the practice was first tried out experimentally in 1950 when 36 acres were burned. About half of the burn was reseeded with crested wheatgrass, slender wheatgrass, brome, Kentucky bluegrass, and timothy.

National forest permittees have cooperated with the USDA Forest Service in the establishment of range transects to study range conditions and trends. The permittees have worked to improve range management by using a herder to distribute stock, by extensive salting, water development, cross fencing, and sagebrush eradication.

To give the grasses a chance to get started, the area was not grazed the first season and only lightly grazed the next. Many of the seeded grasses now persist, but the dominant cover consists of the native fescues and wheatgrasses which have reclaimed the reseeded area.

In 1952, a roto-beater was used to remove big sagebrush on 308 acres of the Crow Creek range that was similar in topography to the area burned. The roto-beater's steel flails turn at high speed to beat and shred the sagebrush. Reseeding this area was considered unnecessary since there was a relatively good stand of native grasses beneath the sage.

A third method of sagebrush control was demonstrated in June 1957 when 900 acres of big sagebrush were sprayed by plane with a mixture of 2, 4-D and 2, 4, 5-T in diesel oil. The mixture was applied at the rate of three gallons per acre, with 2 pounds of acid to each three gallons of oil.

All three methods have demonstrated a positive control of big sagebrush. Areas where sagebrush was removed, either by burning or beating eight and six years ago, are easily recognized now in contrast to nearby untreated areas. Particularly noteworthy is the absence of sagebrush and the increased density and vigor of the grasses in the treated range compared to the untreated. It is still too early to determine fully beneficial effects on the native grasses in the ranges which were sprayed in 1957. However, it was evident in the fall of 1957 that the chemicals used could produce a good kill of the sagebrush.

Figure 1. The area in the right foreground was cleared of sagebrush six years ago by a rotobeater. Native grass understory made it unnecessary to reseed.

Figure 2 (*left*). Rotobeaten strip of sagebrush on the Crow Creek range. Rocky ground made it necessary to rework some areas for effective control of the brush.

Figure 3 (*right*). Rotobeater drawn by crawler tractor in sagebrush removal project on the Crow Creek range, July 1952.

Of the three methods employed, burning was the cheapest. The chief disadvantage of burning is the danger of uncontrolled fire, which may do more damage than good. Too hot a fire will kill desirable understory grasses and perennial weeds. A fire not hot enough will not thoroughly kill sagebrush. In addition, burning generally requires reseeding with no grazing the following season and only light to moderate grazing the second season (Pechanec, Joseph F. and George Stewart. 1944. *Sagebrush Burning—Good and Bad.* Farmers' Bull. No. 1948, 32 pp. USDA, Washington, D. C.).

Although roto-beating does a good job of sagebrush removal, the method is limited to relatively level and rock-free areas. The method is expensive. On the Crow Creek tests, it cost $25.00 an acre to remove sagebrush by roto-beating.

Aerial spraying, because of the economy involved, may be a suitable method. On the Crow Creek range the cost was about $3.00 an acre. One disadvantage of spraying is that the chemical may kill desirable weeds and shrubs.

The benefit derived from removal of big sagebrush is still a debatable subject in this area. Big sagebrush is valued as a winter sheep pasture and has ability to collect and retain snow. Where a fairly good composition of native grasses exists as an understory, removal of big sagebrush seems to provide definite benefits.

Sagebrush is a keen competitor with grass for available soil moisture and nutrients. Removal of the sagebrush provides release of moisture and nutrients for the grasses, thus promoting earlier growth for the grasses in the spring and ultimately greater vigor and density.

On many western range lands outstanding improvements have been obtained through sagebrush control. In eastern Idaho, for example, burning of big sagebrush with a suppressed grass understory produced an increase of 69 per cent in grazing capacity within 3 years. In northern Nevada, plowing big sagebrush and seeding to crested wheatgrass increased grazing capacity 80 per cent (Pechanec, Joseph F., et al. 1954. *Controlling Sagebrush On Range Lands.* Farmers' Bull. No. 2072, 36 pp. USDA, Washington, D. C.).

Sagebrush control has been recommended primarily for ranges used by livestock in the spring, fall, and summer, but not for those grazed chiefly in winter. On winter ranges, sagebrush, especially black sage (*Artemesia nova*), is often a desirable forage. Likewise, control on big-game winter ranges is not recommended where silver sage (*Artemisis cana*) is an important source of browse.

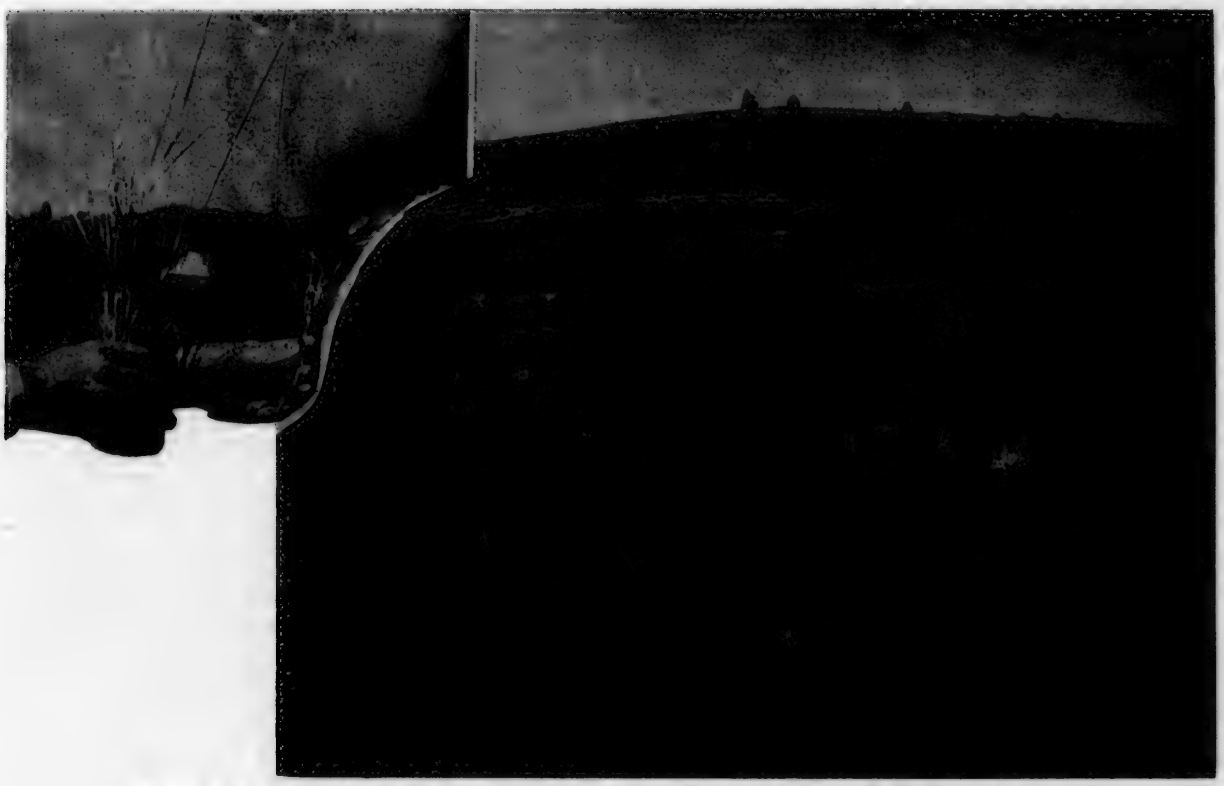

Figure 4. Density and vigor of native grass species (*foreground*) has materially improved six years after rotobeating big sagebrush on the Crow Creek range. Some reinvasion of sagebrush has occurred. (*Insert*)—Increase of grass density resulting from sagebrush removal is demonstrated. The large healthy blue-bunch wheatgrass on the left shows what happens when sagebrush is removed. The plant on the right was representative of adjacent untreated sagebrush area.

Editorial Guidelines for the Journal of Soil and Water Conservation

The following Editorial Guidelines for the JOURNAL OF SOIL AND WATER CONSERVATION have been approved by the Council for the guidance of the Editorial Board and the Editor in selecting and presenting the contents of the JOURNAL.

Prospective authors also will find these guidelines helpful in preparing manuscripts.

THE JOURNAL OF SOIL AND WATER CONSERVATION is a *technical and professional* journal, as distinguished from a *scientific journal* on the one hand and an *educational* magazine on the other. It is the official organ of the Soil Conservation Society of America and is dedicated to promoting the stated objectives and philosophy of the Society (Article II, Section 1 of the By-Laws, published in the July 1958 issue of the JOURNAL).

Objectives of the JOURNAL

1. "To advance the science and art of good land use." To this end the functions of the JOURNAL are to:
   a. *Inform* its readers of new advances in its subject-matter field.
   b. *Record* original information in the specialized field of land use and conservation.
   c. *Stimulate* creative thinking and encourage investigations on unsolved problems and controversial questions.
   d. *Evaluate* information and ideas in relation to good land use and conservation.
   e. *Summarize and organize*, from time to time, significant information on topics relevant to the science and art of good land use.
   f. *Discuss and debate* questions on philosophy and public policy in the field of land use and conservation.
2. To help the reader advance in his profession or practice of conservation. To this end, the functions of the JOURNAL, in addition to the foregoing, are:
   a. To inform the reader of useful techniques and methods, equipment, tools, or devices that he can use in his work.
   b. To list and evaluate new publications about land use and conservation in related subject matter fields.
   c. To keep readers informed of programs and activities that affect their interests.
3. To serve the organizational needs of the Society. To this end, the functions of the JOURNAL are:
   a. To inform members of internal organizational affairs of the Society.
   b. To provide a means of communication among officers, members, and chapters.
   c. To express the official viewpoint and philosophy of the Society.

Subject Matter Field

The JOURNAL is concerned with "the science and art of good land use." This is interpreted to include those sciences, arts, and professions dealing with the use and conservation of land in the ecological sense; i.e., showing a concern with the interdependencies of these resources and their relation to economic, esthetic, and other human values. Information pertaining to any of the specialized fields must show a definite relationship to the central theme of good land and water use and conservation.

Content of the JOURNAL

The content of the JOURNAL should fall within the defined subject-matter field and should serve one or more of the objectives stated in the foregoing section.

1. The major articles of the JOURNAL should serve its primary purpose to advance the frontiers of the science and art, or profession, of conservation. Their content should in some way be new to the published literature. It is not a major function of the JOURNAL merely to spread accepted ideas or promote particular programs; this function is better performed by educational and popular or trade magazines.

The following types of material are appropriate for the principal articles of the JOURNAL:

a. Information based on recent research results, field observations, or experience in the specific field of land use and conservation.

b. Interpretation or application of information from other specialized fields, including economics and

social sciences, to the problems of land use and conservation.

c. Description and explanation of new or improved techniques and field practices.

d. Description and explanation of new programs of action by agencies or organizations of wide influence.

e. Presentation and discussion of new philosophy or policies in conservation.

f. Pro and con discussions of controversial questions or issues.

g. Reviews of pertinent and significant information on particular topics within the JOURNAL's subject-matter field.

The following types of material are not considered appropriate for JOURNAL articles:

a. Individual experience or success stories, whether of farmers or ranchers, agencies, or organizations. Accounts of individual experiences, of course, can be used effectively to illustrate generalizations. General conclusions drawn from a number of individual experiences often make worthwhile articles of general interest.

b. Articles that treat a specialized topic (e.g., in agronomy, engineering, etc.) without a plain relationship or application to land use and conservation.

c. Articles intended primarily to promote the interests of a particular agency, organization, or group.

d. Articles that advertise or endorse specific commercial products. Advertising material must be plainly labeled as such or identified by distinctive typography, e.g., see page 245, Volume 13 and page 34, Volume 14.

2. Material intended primarily to advance the individual in his profession, rather than to advance the science and art on which the profession is based, should be set apart typographically from the major articles. This can be done by confining such material to briefer articles with smaller headings and to special departments. The following types of material are considered appropriate for this treatment:

a. Brief articles describing improved techniques and methods.

b. Accounts of unique conservation accomplishments.

c. News of current developments in the conservation field.

d. Reviews of new books in the subject-matter of the JOURNAL. Every review should be signed by the reviewer.

c. Lists and abstracts of new technical publications, educational materials, and teaching devices. Advertising pieces and unpublished materials that are not available upon request should not be listed.

f. Brief descriptions of new equipment useful to conservationists.

3. Material primarily concerned with the organizational activities and interests of the Society also should be confined to special departments or otherwise clearly distinguished from the major articles. Editorial comment and letters to the editor should be clearly distinguished typographically.

Audience

The JOURNAL is written primarily for members of the Society and people of similar interests who would be eligible for membership. These are mostly people engaged in soil and water conservation professionally as technicians, research workers, planners, administrators, generalists, educators, conservation leaders, farmers and ranchers. Most are college graduates or have attained comparable learning by experience and reading. Many diverse specialized fields are represented; few, if any, of the readers can claim advanced training in all of the subject matter treated by the JOURNAL.

Although most members are in the United States, other countries are represented. The JOURNAL is deposited in libraries and is used as a source of conservation information in all parts of the world.

Editorial Standards

Material accepted for publication will be written and edited to the following standards:

Literary Style: Most major articles will be written in technical or expository style. They should be factual and objective, the language simple, direct, and positive. They may be in first, second, or third person, and in the mood or tense that suits the subject matter. History and literature reviews should be held to the minimum needed to relate the new information to previous work and to show its significance to the field of conservation.

The source of new or unfamiliar facts should be shown clearly by describing the research or observational methods used or by citing sources (published or otherwise). The logic leading to conclusions should be clearly stated. Each article should give sufficient information so that the readers can judge the validity of the conclusions.

Material included in the briefer articles, news notes, and special sections of the JOURNAL may be less formal and in a style suited to its purpose. ■

FIELD NOTE BRIEFS

"Man can afford to be deeply interested in his ignorance—an incurable defect, no matter how we brag of what we know. Those who know most are best aware of their limitations. To recognize these limitations and to honor and respect them is at last to make a kind of sense out of the world."—MARK VAN DOREN.

(From guest editorial, "A Motto for Today", the *Saturday Review,* June 6, 1959.)

GRASSLAND RESEARCH

Two-fifths of the land surface of the earth was originally grassland, and the most abundant grassland mammals are rodents. Yet, in every aspect of a study of the most widely known native rodent in the best-known grassland region of the United States, I have encountered an array of unknown relationships, conflicting data, and controversial ideas. This frustration has impressed on me the need for research on the basic ecology of grasslands and particularly on the relations among range plants and animals living under natural conditions. A recent book on the grasslands of the Great Plains (Weaver and Albertson, 1956) scarcely mentions native ungulates, rabbits, or rodents and cites none of the major papers on their ecological effects.

One reason that study of these relations has been neglected is that to understand them requires broad knowledge and many years of continuous investigations. Studies must be long-term because fluctuations in animal populations are irregular, ecological effects may not become evident until long after their initiation, and the vegetation itself changes from year to year. To be sure, grassland investigations have been carried on for decades at range experiment stations, but these studies are mainly confined to the effects of livestock on forage plants and seldom touch on the influences of native animals or relationships in natural communities.

How far have we modified the land from its original state? How are dust storms, grasshopper outbreaks, and rodent increases related to land use? To investigate such problems and many others . . ., we need large natural grassland areas where all biotic conditions can be studied continuously. There are no such areas. Our national preserves that include grassland have been modified by heavy human use, livestock grazing, predator and rodent destruction, and other artificialities. Ideally the nation should have a natural preserve in each region where climate, soil, and biota are significantly different. The values of natural areas as a yardstick for comparison with agricultural lands have been pointed out by many. Shelford (1942) enumerated a dozen reasons why grasslands should be exceptionally profitable for continuous biological research of great importance to humanity.

The many advantages of creating a Great Plains National Monument for the preservation and study of grassland animals and plants in primitive state, and for public enjoyment, have been outlined by Cahalane (1940). Because of marginal effects from surrounding lands and the wide-ranging habits of large mammals, such a preserve must be large, perhaps 1,000 square miles in area. This size is not excessive considering that the land is semiarid and of low value, and that much of it is already in public ownership. Many organizations including the Natural Resources Council, the Ecological Society of America, the Grassland Research Foundation, and the Nature Conservancy are working for the establishment of natural grassland preserves. If these are not established soon, the opportunity may be lost. More than half of the United States is grassland. Most of our food is derived from grass. It would seem of utmost value to protect samples of native grassland communities for enjoyment and study, now and in the future. (Reprinted by permission from **Prairie Dogs, Whitefaces, and Blue Grama** by CARL B. KOFORD. *Wildlife Monographs No. 3,* December 1958. 78 pp. Can be obtained from the Wildlife Society. c/o Remington Farms, Chestertown, Maryland. Price 75c.)

"COWBOYS, CATTLE AND COMMERCE"

Tulsa, Oklahoma, 9th graders are learning all about Oklahoma's cattle industry via a lively and vivid study unit called "Cowboys, Cattle and Commerce." This new addition to the curriculum is the outcome of a project initiated under the leadership of Carl Oliver, Supervisor of Social Studies in the Tulsa school system.

Utilizing one of the most colorful chapters in American history, the era of the cowboy and the Old West, the unit is designed to give students an elementary understanding of the operation of the market or price economy which is characteristic of the American economic system. Emphasis is placed upon such concepts as demand, supply, organization, market and the role of government.

"Rather than use the historical or abstract approach which is difficult even at the college level, it was decided that the case study was a more suitable approach because it is more interesting to the students. Furthermore, it is important for students to realize that economics is neither abstract nor unreal, but is essentially an analysis of practical every-day problems."

The cattle industry was chosen, not only because of its importance to Oklahoma, and its colorful nature, but because it represents a highly competitive industry (land-use operation) which is relatively free from regulation.

The Teachers Guide makes constant cross-references to two other industries indigenous to Tulsa which represent contrasting market situations. The oil industry is an example of what economists call "monopolistic competition" and the air transportation industry is almost completely government-regulated.

Through examples drawn from their own community's economy, Tulsa's 9th grade students will achieve a knowledge of basic economic relationships upon which they can build in the future.

Members of the 9th Grade Committee are now in the process of testing "Cowboys, Cattle, and Commerce" in their own classrooms. Sub-committees have been organized to locate and develop enrichment materials for the unit. At the end of this trial period the unit will be evaluated, expanded and edited. In the school year 1959-1960 it will become an integral part of the curriculum for all 9th grade pupils in the Tulsa Public Schools.

The Tulsa unit has been developed in collaboration with the Joint Council on Economic Education. (A more complete description of the Unit is published in the JCEE *Newsletter,* May, 1959. JCEE, 2 West 46th St., New York 36, N.Y.)

[*EDITOR'S NOTE: Here is an educational approach that may have fine application to "conservation" units. It is to be hoped that this Tulsa unit will emphasize strongly both range ecology and conservation. To not do so would be a serious omission.*]

—SCSA—

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GYPSUM CLEARS MUDDY PONDS

Agricultural gypsum has been proved to be very effective as a simple and inexpensive way to clear muddy ponds.

Tests at the University of Missouri and University of Kentucky showed the effectiveness of clearing muddy ponds or small lakes by the application of finely ground agricultural gypsum applied directly to the water. Many farm ponds throughout the country have been cleared by farmers and ranchers using agricultural gypsum.

This clearing action is caused by the flocculating effect of the gypsum on the suspended clay particles in the water. The gypsum in bags is applied by scattering it from a boat so that most of the surface receives some gypsum. Spreading may also be done from the shore on smaller ponds. The amount of gypsum necessary varies to the depth of the pond, but best results have been achieved when applied at the rate of about 12 lbs. per 1,000 cubic feet of water. This is about 700 pounds for a half-acre lake or about one ton for an acre lake. A rule of thumb for estimating the volume of a pond is to consider the average depth of the pond equal to one-third of depth at the deepest point. This average depth multiplied by the area in square feet gives the volume of the water to be treated.

If circulation of water in the pond is poor, a second application may sometimes be needed to get the desired results. Under normal conditions, the treatment will remain effective for considerable periods of time. The gypsum has no undesirable effect on the water if used for drinking purposes, and it will not affect plant or animal life, and will not change the hardness of the water.

In addition to furnishing clear drinking water for cattle, the ponds become much better recreation spots for swimming and fishing.—ROBERT F. BARIE.

Pond cleared by application of gypsum. (*Insert*)—Pond is so muddy that man's hand cannot be seen. Clear ponds offer a greater variety of uses.

CONSERVATION INCLUDES RECREATION

In his talk to the *Soil Conservation Society of America* in Asheville, Maurice K. Goddard, Secretary, Pennsylvania Department of Forests and Waters, reviewed the growth of leisure time, step by step, since 1900. He concluded that in another 10 years the amount of leisure time would increase by 25 per cent over the present. This puts a premium on proper use of leisure.

A chief burden will be on recreation opportunities and facilities. A great responsibility therefore rests on planners and legislators to provide the best possible conservation programs, well staffed with competent, adequately compensated professional conservationists.

—SCSA—

Worth Growing About!
Worth Knowing About!

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COMING EVENTS

Although information was received too late to be effectively announced in the JOURNAL, the **Western Resources Conference,** July 13-17, to be held on the University of Colorado campus, Boulder, Colorado, has all the marks of being most outstanding. Undoubtedly many SCSA members, especially in the West, will be attending. Further information on this meeting and future meetings can be obtained by writing Committee on Western Resources, New Chemistry Building, Room 305, University of Colorado, Boulder, Colorado.

July 19-22, the meeting of the **Western Society of Crop Science** will be held in Laramie, Wyoming.

The **Conservation Education Association** sixth annual work conference will be held at Sul Ross College, Alpine, Texas, August 17-20, 1959. Advanced information can be obtained by writing W. E. (Bill) Williams, Sul Ross College, Alpine, Texas.

E. D. Bolton, SCSA Council member at-large, will be the Society's official representative at this meeting.

Last year at the CEA conference in Salt Lake City, Utah, 25 SCSA members were in attendance.

August 27, 1959, the Water Resources Committee of the Illinois State Chamber of Commerce will sponsor its third annual state-wide **Water Supply Conference,** at the Abraham Lincoln and St. Nicholas Hotels in Springfield, Ill. Theme of the conference is "Water for Industry." For more details write Illinois State Chamber of Commerce, 20 North Wacker Drive, Chicago 6.

Nov. 16-19, the **American Society of Agronomy** and the **Soil Science Society of America** will hold their annual convention in Cincinnati, Ohio.

MANPOWER FOR CONSERVATION

WHAT will be the status of the worker in soil and water conservation in the "space age"? Will he be given the same recognition and remuneration as the engineer or physical scientist in other endeavors? Answers to these and other questions will determine, to a great extent, the supply and quality of scientific manpower available to the conservation field.

The very nature of the problems of land use and soil and water conservation requires scientists from a great many fields. The membership in the Soil Conservation Society of America represents this broad background of training for its members are allied to, and active in, many sciences.

Developments in the so-called "space age" have brought into sharp focus the need for trained scientists competent in the physical sciences.

This added emphasis on physical scientists is necessary, and no person would question the need. "But what," ask those responsible for conserving land and water resources, "is the future for scientists and other workers in soil and water conservation and use?" It may seem at times that the fundamental importance of soil and water to the welfare of all human beings is not fully understood and appreciated by all lay and political leaders.

Like military science, the science of maintaining and utilizing land and water resources will require a better trained and larger supply of qualified manpower in the future. Skilled specialists will be needed in soils, agronomy, range, forestry, biology, engineering, hydrology, geology and recreation, not to mention administrators and generalists in science and engineering.

Although, at present, a few crops in the U. S. A. are in excess supply, this should not obscure the facts that world population is growing and that the resource base has some limitations. The needs, therefore, for trained men and women in land and water sciences are growing. The opportunities are numerous for employment in government—federal, state, and local; in agriculture as well as in industry and other vocations. Defense and international relations problems, plus competing demands for land and water supplies, create also a need for men trained in politics and humanities. Thus, it is essential that top-level planning must proceed at once to obtain the properly balanced and trained manpower supply needed in conservation.

Dr. J. W. Jones of Clemson College (South Carolina), Chairman of the Committee of the Resident Instruction Section of the American Association of Land Grant Colleges and State Universities, indicates that studies of his committee show about 7,000 to 8,000 graduates in the U. S. A. in agricultural sciences each year, with an estimated 15,000 new jobs available. It is doubtful if many scientific fields experience a greater shortage of graduates than exists in agriculture. A similar situation may exist in other countries, especially those most needing expansion in food production.

However, in many instances, graduates going into soil and water conservation and agriculture are not included in the category of engineers and scientists. The curriculum for agriculture and other related sciences is largely scientific in content, and these graduates properly belong in the classifications of scientists.

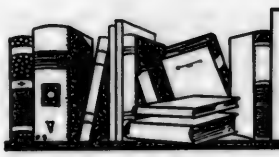
The Policy Committee for Scientific Agricultural Societies was organized several years ago by the American Dairy Science Association, American Society of Agricultural Engineers, American Society of Agronomy, American Society of Animal Production, American Society of Range Management, and the Soil Conservation Society of America. The committee's purpose is to develop a recognition of and to point out the manpower problems and needs in the field of agriculture, and to secure adequate representation on the Scientific Manpower Commission.

The Policy Committee has two representatives on the Scientific Manpower Commission. The Commission is an independent agency organized in 1953 by the Engineer's Joint Council and other scientific societies. The Scientific Manpower Commission is supported by the contributions from the member agencies, with primary support from industry.

The Scientific Manpower Commission is vitally concerned with broad manpower policies relating to scientists and mathematicians. It is equally interested in guiding well-qualified young people into scientific careers and seeing to it that these students have the best of instruction. It is concerned with the efficient utilization of scientific personnel in both civilian and military assignments. It follows closely the supply and demand picture, and maintains close liaison with all branches of the government on matters relating to scientific manpower. A major role of the Commission has been the presentation of factual material to congressional committees dealing with selective service and manpower legislation.

The Soil Conservation Society of America, through the Policy Committee of Scientific Agricultural Societies, is supporting and participating in the activities of the Scientific Manpower Commission. It is to be hoped that these activities will lead to better understanding of the contributions of people specifically engaged in soil and water conservation in particular, as well as in the agricultural sciences in general. Presently there is need for fuller understanding as to the place, need, and importance of the use of highly-trained manpower in these fields. Perhaps, with the gaining of this recognition, we can make a modest start in achieving consideration of the fact that these workers also materially contribute to the "space age."—JOHN W. BARNARD, *SCSA representative, S. M. C.*

Soil and water technicians and scientists receive some in-service instructions at the USDA Coshocton Training Center in Ohio. As yet all too few colleges and universities offer degrees in soil and water conservation. Would greater recognition be accorded the field if more schools granted undergraduate and graduate degrees in soil and water conservation?



Literature Briefs

Effect of Grazing on Fertility of Farm Woodlot Soils in Southern Wisconsin. By Albert L. Leaf. *Journal of Forestry*, Vol. 56, No. 2, February, 1958, pp. 138-139.

"The results of this study indicate that grazing appreciably reduces the fertility of the surface soil layers which serve as seed beds for natural reproduction. This is probably because the loss of nutrients caused by the removal of forage and leaching is not balanced by the return of nutrient elements from the deep soil horizons. Grazing exerts a profound adverse effect on the chemical properties of forested soils."

Water Witching U.S.A. By Evon Z. Vogt and Ray Hyman. 248 pp. Appendices: I. Letter of Explanation and Dowsing Questionnaire Mailed to County Agricultural Extension Agents; II. Water-Well Location By Scientific Divination, bibliography. 1959. University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill. $4.95. (Reviewed by WILSON F. CLARK, Billings, Montana.)

In this well-written, well-documented, entertaining and informative book, the authors (an anthropologist and a psychologist) offer an examination of water-witching. Water-witching is widely practiced. The authors were seeking sociological and psychological explanations of why, in an age of science, water-witching is still so prevalent. By means of analysis of a tremendous amount of data and an exhaustive questionnaire to many county agricultural agents, the authors sought to present a fair and reasonable picture of this age-old practice.

While concluding that water-witching has no scientific basis and is no better than mere chance in its success, the authors sympathetically recognize that the practice still meets a genuine need. They recognize that there are compelling social and psychological reasons for the continuance of water-witching—anxieties of those wanting a water supply are reduced. Through faith in its efficacy, the practice, furthermore, assists in important decision making in situations in which an individual water-wanter has few or no basis for decision, and in which science (even if some facts are available) cannot be too specific.

The authors have also delved into such aspects as "magical divination". Even though they conclude that water-witching is "magical devination", they maintain that it is not "superstitious nonsense". In other words, it does provide certain and very specific answers which tend to relieve an individual desiring a supply of groundwater of an often impossible and anxiety-laden decision. Herein lies a large value of water-witching.

Summary of Floods in the United States During 1952. U. S. Geological Survey, Water-Supply Paper 1260-F. Pp. 687-713. 1959. (U. S. Supt. of Documents, Washington 25, D. C. 20c)

Study and Interpretation of the Chemical Characteristics of Natural Water. By J. D. Hem. U. S. Geological Survey, Water-Supply Paper 1473. 269 pp., illus. (Supt. of Documents, Washington 25, D. C. $1.50.)

The Living Forest. By Jack McCormick. 127 pp., illus. 1959. Harper & Bros., Publishers, 49 E. 33rd St., New York 16, N. Y. $3.95.

The contents of this book have been drawn from the exhibits in the Hall of North American Forests which was unveiled in the American Museum of Natural History in New York City in May, 1958. The exhibit, the most comprehensive of its kind in the world, was under preparation for at least ten years.

The Living Forest is designed for the general reader, but there is no doubt that it will be used very extensively by educators and camp leaders. The book is a most notable addition to the steadily growing list of ecological and natural-resources interpretative literature. Indeed the excellent drawings by Matthew Kalmenoff of the Museum staff multiply tremendously the interpretive values of the book.

The traveler who seeks to gain a more intimate knowledge of the North American landscape will wish to include this book as an additional guide. For the air traveler, there should have been a set of aerial views showing some of the major kinds of forests prevailing in North America. To have included such photo views would have greatly increased the value of the book.

Stars Upstream: Life Along An Ozark River. By Leonard Hall. (Foreword by Ira N. Gabrielson.) 252 pp., illus. (Charles Schwartz photographs). 1959. The University of Chicago Press, 5750 Ellis Ave., Chicago 37, Illinois. $3.95.

Here is the Current River of Missouri. "Every region", says Hall, "has its 'Current Rivers.' Time grows short in which to save them and develop them for the use of all Americans who love the outdoors."

Len Hall has been an astute student of the "science and art of good land water use." He has been taught by some of America's top soil scientists, ecologists, botanists, geographers, and some rugged but learned foresters.

A float trip or canoe trip down the Current can be a high-quality experience. Hall made it more than high quality for he relates the Current to land-use practices, past, present and future. The destiny of America lies in large part in just how we react to *Stars Upstream*.

Essentials of Forestry Practice. By Charles H. Stoddard. 258 pp., 99 illus., tables, maps, index. Appendix: Forest Terminology; Characteristics of Important Commercial Timber Species; Forest Management Plans for Small Properties; Timber Sale and Operating Agreement Forms; Principal Federal, State, and Private Forestry Organizations; Bibliography. 1959. Ronald Press Company, 15 East 26th Street, New York 10, N. Y. $5.50.

This publication will be useful not only to practicing foresters but to those who may wish to acquire some practical knowledge: the pre-forestry student, the high school vo-ag student, the forest-aid or technician (in-service training), the farm woodland owner, and land-use technicians who may wish to gain an understanding of forest practice essentials.

This book is also serving as one of the texts in the "National School of Forestry and Conservation" (see page 33, January 1959, JOURNAL; and advertisement, page 129, May 1959).

Introduced Grasses and Legumes. Section 5 of a series Pasture and Range

Plants. (Prepared by numerous contributors.) 26 pp., illus. in full color. 1958. Phillips Petroleum Company, Bartlesville, Oklahoma. (Copies can be obtained from local Phillips dealers, or by writing to Bartlesville. Free.)

In this beautifully illustrated booklet, 8½ x 11 inches, there are 29 grasses and legumes illustrated in full color, and with many useful facts about each species.

Responses of Brush Seedlings to Fertilizers. By A. M. Schultz, H. H. Biswell, and J. Vlamis. *California Fish and Game* 44: 335-348 (Oct., 1958).

Information on the response of brush plants to fertilizer is meagre compared to that of agricultural crops, range grasses, or forest trees. With an objective of managing shrubs on game ranges, this paper is an outgrowth of various experiments involving competition between brush and grass, the effects of prescribed burning on soil fertility, and the long-time influence of brush vegetation on soil properties and assays of wildland soils by means of fertility pot tests. Literature cited contains 15 references but does not mention *Fire as a Tool in Management of Brush Ranges* by H. L. Shantz (California Division of Forestry, 1947), which was an excellent summary of this topic up to 1947.

Methods for Studying Soil Microflora-Plant Disease Relationships. By Leander F. Johnson, *et al.* 178 pp., illus. 1959. Burgess Publishing Co., 426 So. 6th St., Mineapolis, Minn. $3.50. (Reviewed by T. M. McCALLA, Lincoln, Nebraska.)

This is a detailed compilation of techniques used in the study of soil microorganisms, particularly those with plant disease relationships. These techniques deal essentially with isolation and study of growth and products of growth of microorganisms from the soil. Well documented with references, formulae of selected culture media, and data analyzing, experimental design and statistical procedures.

Fish Conservation Teacher's Manual (Illinois Resource Management). By Alvin C. Lopinot. 71 pp., illus. 1958. Illinois Dept. of Conservation, Springfield, Ill. (No price given, distribution probably restricted.)

Illinois is rapidly coming to the top in production of manuals in conservation of resources for teacher use. Throughout this new manual the "ecological approach" is strongly apparent. B. K. Barton, director of conservation education in Illinois, and an active member of the SCSA Northern Illinois chapter, states in the preface that "cognizance of the interdependency of one resource upon other resources is a most significant accomplishment in education for the wise use of our resources."

One can infer from this manual that in the maintenance of *quality* and *quantity* of fisheries (particularly on inland streams and rivers) there is an obvious criterion as to how effectively the "science and art of good land use" is being applied. Those areas wherein agriculture and industry have maintained healthful and productive conditions in the "natural" bodies of water, might well, over the long run, prove to be among the most advanced areas in applying the most advanced "science and art of good land use." If Illinois can raise a generation of youth dedicated to considering the "interdependencies" of resources, a very considerable step forward will have been taken in civilization of human beings.

Nature Trail Labels. Department of Resource Development, Michigan State University, Park Management Bull. No. 5. (Can be obtained from The Bulletin Office, Room 10 Agricultural Hall, Michigan State University, East Lansing, Mich. Price 50c.)

Occasionally land and water resource technicians are called on to prepare labels for outdoor field trips, trails or exhibits. This bulletin may prove helpful as it brings together a large number of different kinds of labels used primarily on nature trails. Many such trails are used to teach concepts of soil and water management. Carefully prepared labels on watershed areas and conservation farms are an asset on tours, and more attention needs to be devoted to the use of and preparation of such labels. Since much time and effort is devoted to field trips on soil and water conservation areas, a very worthwhile study could be made to point up the techniques that have proved most useful.

Norway's Agricultural Policies. By Anthony N. Cruit. *Foreign Agriculture*, May, 1959, Vol. XXIII, No. 5, pp. 9, 10 and 14.

Land policies in Norway have been concerned with (1) redistribution of land; (2) cultivation of new land; (3) establishment of new farmlands; and (4) creation of larger holdings, either through joining of smaller holdings or addition to existing holdings.

In line with general social policies, the government wants to improve the economic status of the least favorably situated farms (89 per cent of farms in Norway are less than 25 acres). The work is primarily toward making farms more effective economic units.

Initial Town Property Survey Report. By the New Hampshire Planning and Development Commission, Concord, N. H. No price given, limited distribution only.

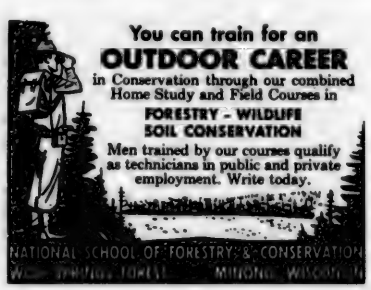
This study made in 1957 reveals that local property tax yields followed this pattern: Manufacturing property, 13.3 per cent of the total tax yield; recreational types of property, 10.6 per cent; farming property, 5.7 per cent. The report is basically a preliminary inventory of local economic data, based on tax assessment records.

Conservation Directory, 1959 (for Polk County, Iowa). 19 pp., processed. County Board of Education, 216 S.W. First St., Des Moines, Iowa. No price given, restricted distribution.

This directory, although intended for local distribution, is noticed because it is an example of a directory that has large value locally. The directory grew out of a series of meetings of representatives of agencies and organizations examining what was being done in bringing about a more orderly development and use of all natural resources of Polk County, Iowa. There was a desire on the part of those meeting to learn more details about each of the agencies and organizations (23 are listed) represented at the meetings. The SCSA main office and the Iowa chapter of SCSA are included in the directory.

REPRINTS AVAILABLE FROM RFF

A list of available reprints of which single copies are free on request can be obtained from Resources for the Future, Inc., 1145 19th St., N.W., Washington 6, D. C. At the present there are 12 titles on this list of RFF reprints, which deal with many topics involving use and conservation of natural resources.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OUTDOOR CAREER
in Conservation through our combined Home Study and Field Courses in
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SOIL CONSERVATION
Men trained by our courses qualify as technicians in public and private employment. Write today.
NATIONAL SCHOOL OF FORESTRY & CONSERVATION

News Notes

PRESIDENT'S COLUMN

SCSA Committees: Committees of the Society are doing an excellent job. The work of some committees is clear-cut. Others must pioneer.

I want to pay special tribute to the more than 30 chairmen of committees. I am in contact with them and know that they are doing a valuable service for the Society. Their final reports, to be submitted in accordance with the By-laws at the annual meeting or at the end of the year, constitute recommendations for immediate actions; recommendations for plans for future activities, or progress; and accomplishments achieved by the committees.

The chairman of the Water Resources committee called me on the telephone a few days ago and said one section of his committee's proposed report should be brought to the attention of the membership at the annual meeting for information purposes. To expedite this portion of the committee's report, we are submitting it to the Council, by mail, and asking for review, comments, action.

SCSA Building: The Council has discussed a number of times owning our own building and, eventually, a new SCSA building. The Development Fund Board, meeting in May, devoted much attention to this and will probably have some specific recommendations to make to the Council in August. We continue to outgrow our space in Des Moines and are constantly faced with rising rental costs. The Council has been of the opinion that we should own our own building as soon as practicable. This year I appointed a special committee to look into the housing problem in Des Moines. This committee has not yet made specific recommendations but is looking into the situation very thoroughly. We are concerned with moving ahead on a plan for a project of this kind which will meet our needs in the near future as well as the years ahead. Ways and means of financing and paying for such a building are being considered. We believe the membership will support this kind of a worthy and important project and take personal pride in such an undertaking.

Commemorative Stamp: Everyone concerned with soil and water conservation is to be honored by the Post Office Department's plan to issue, at our annual meeting in Rapid City, South Dakota, the world's first commemorative soil conservation stamp. This is a big thing for SCSA, not only at the Rapid City meeting, but nation- and world-wide. I am hoping that all organizations, and particularly the Soil Conservation Society of America chapters and individuals, will plan activities suitable for this observance. Please see the May and July issues of the JOURNAL and the special mailings which our Secretary has made to the membership and to the chapters. Also, do your best to be present for the ceremonies the morning of August 26 and the good program and fellowship of the whole convention.

A. C. WATSON, *President.*

ANNUAL ELECTION IN PROGRESS

All members of the Society have received ballots for the election of officers and council members for 1960. The Society's annual election is conducted by mail ballots and the bylaws specify that it will be timed according to the dates of the annual meeting.

This year all ballots must be returned to headquarters no later than August 3, 1959.

Provision is made for election of officers for a one-year term and for council members to serve three years. One council member is elected at-large each year. Other council members serve a region of the Society. This year elections are being held in the Great Plains and the Southeastern regions of SCSA.

Early in 1959 a nominations committee was appointed, with Herbert A. Flueck of St. Paul, Minnesota, serving as chairman. Nominations were made by chapters or by petition of ten or more members. The following slate resulted:

For President: E. L. Sauer, Urbana, Ill.

For First Vice-President: Walter C. Gumbel, Fairmont, W. Va. and James K. Vessey, Atlanta, Ga.

For Second Vice-President: A. H. Veazey, Raleigh, N. Car. and R. D. Hockensmith, Washington, D. C.

For Treasurer: Howard F. Barrows, St. Augustine, Fla.

For Council Member At-Large: Austin L. Patrick, Washington, D. C., I. O. Hembre, Madison, Wis., and E. D. Bolton, Nacogdoches, Tex.

For Council Member Great Plains Region: Arthur R. Marquardt, Lincoln, Nebr., Bernard K. Geraghty, Manhattan, Kansas; Horace J. Harper, Stillwater, Okla.; Leslie R. Albee, Huron, S. Dak.; and Elmer L. Worthington, Mandan, N. Dak.

For Council Member Southeastern Region: L. M. Hollingsworth, Gainesville, Fla., and Willis J. Huddleston, Cookeville, Tenn.

Members in the Great Plains and in the

The Soil Conservation stamp is the sixth in a series on conservation. Over the next several years, with a concerted drive and cooperation of all soil and water conservation groups, it should be possible to get well over 170 million (number initially printed) of the Soil Conservation stamp used. There is a great opportunity in making use of this easy and remarkable way to bring the message of soil and water conservation to millions of people. And, don't forget to use the "OFFICIAL" first-day cover sponsored by the Soil Conservation Society of America.

Southeast will receive the ballots for their regions only.

In the mailing of ballots to members a biographical sketch of each candidate was enclosed.

"Runoff" Election Held

Under the new bylaws, only one candidate from a region may be on the general election ballot. In addition only one member from a state may be on the ballot for regional council member. This bylaw provision made it necessary to hold "runoff" elections in the North Central Region, the Great Plains Region, and Kansas and Nebraska.

The Michigan Chapter nominated I. O. Hembre of Wisconsin for council member at-large, while the Wisconsin chapter nominated Cyril Kabat. In the special election it was determined that I. O. Hembre's name would be on the ballot.

The South Dakota Chapter nominated W. E. Dittmer while the Fort Worth Chapter (Texas) nominated E. D. Bolton. In the special election, E. D. Bolton received the most votes and his name went on the general ballot.

In Nebraska, the Lincoln chapter nominated A. R. Marquardt, while the Salina Chapter (Kansas) nominated M. D. Atkins of Nebraska. Marquardt received the nomination. In Kansas, Bernard Geraghty (nominated by the Manhattan Chapter) received the most votes in a contest with Tom Dicken, nominated by the Ark River Bend Chapter (Kansas).

Chairman of the Elections Committee (ballot counting) is Richard Wilcox of Des Moines.

Society members will also have the opportunity to vote on the outstanding articles in the JOURNAL OF SOIL AND WATER CONSERVATION during the past year. A ballot on this was included in the general mailing.

More than 1,400 members cast ballots in the "runoff" election, nearly as many as voted in the general election last year! Members are encouraged to cast their ballots, thus helping the Society to maintain the leadership desired by the majority. Results of the election will be announced at the Society's 14th annual meeting, Rapid City, South Dakota, August 26-28.

DEVELOPMENT FUND BOARD MEETS

On May 27 the newly-appointed Development Fund Board held its first meeting in Washington, D. C., with the Society's Executive Committee. Plans were made for the promotion of special projects through use of funds to be administered by the Board.

The members of the Development Fund Board are: Firman E. Bear, Russell G. Hill, J. S. Russell, E. H. Taylor, C. R. Henry, Howard F. Barrows and H. Wayne Pritchard.

At this first meeting projects were discussed and arrangements made to present them to the Council for formal approval. In general the projects included graduate, field and research fellowships, publication of a monthly Journal, scholarships, preparation and publication of special reports, SCSA awards, distribution of the JOURNAL OF SOIL AND WATER CONSERVATION for special purposes, an SCSA home office building and sponsorship of representation at international meetings.

It was agreed that members of the Society should be given an opportunity to contribute at will and as preferred to scheduled projects. Efforts will be made to secure additional funds from foundations, industry and other sources.

Income from sustaining memberships may or may not be directed to the use of the development fund board. To date the money from sustaining memberships has been set aside for projects beyond the Society's regular program.

Last year, members were informed of the possibility of joining as sustaining members. They were also given the opportunity to contribute to the Development Fund.

Individuals may contribute sums of any amount to the Development Fund.

Sustaining membership in the Society for individuals is $20 plus the regular fee for the parent Society which is $5.00, making a total of $25.00. Most individuals also join with a local chapter.

Contributions and memberships are tax deductible. The Society is a non-profit organization and is so recognized by the Internal Revenue Service.

A total of $1,285.00 for sustaining memberships and $351.50 for Development Fund has been received to date during 1959.

Here are the contributors to the Development Fund for 1959:

Frank T. Denham	Ruben L. Parson
Chas. H. Stoddard	Ross D. Hogan
Lemuel J. Peet	Lee W. Wirt
Robert L. Hetzler	E. P. Mauk
John O. Rigo	Paul T. Moore
David S. Findlay	Max M. Soeth
Don Bofus	William H. Brown, Jr.
Clarence Prentice	William D. Ausmus
George Salsbury	Joe Worrell
Harold T. Goodwin	E. D. Bolton
John W. Barnard	Ralph Kisler
A. D. Stoesz	Ramon L. Kent
W. R. Keyser	David E. Whitenack
Samuel J. Smith, Jr.	John E. Rigg
John Grant	Danley Cole, Jr.
Amherst Eaton	Clarence Engberg
H. Wayne Pritchard	Ezra R. Benton
Frederick Jentsch	J. S. Loyd
J. L. Smith	Ralph H. Hill
Lemoine D. Rinehart	Robert G. Wilson
William J. Endersbee	William L. Moore
Theodore A. Neubauer	V. E. Ahlrich
W. G. Tippit	George Wilson
Charmian Crittenden	George Chipman
Esther P. Perry	Jose Marull
R. A. Schwandt	E. S. Fellows
Victor M. Uhlik	Merton L. Otto
D. J. Boyd	Arthur Roggendorff
J. E. Rand	Leona Velen
J. E. Trevathan	Doris Velen
S. R. Bacon	Ira E. Whitford, Jr.
Alexander Nunn	Paul Albosta
G. H. Helweg	Glenn Westberg
Martin H. Schaeffer	Willie T. Holmes
R. V. Knight	T. S. Buie
Dan Spruill	Richard H. Pough
Richard A. Wilcox	George E. Tabb
Rev. Francis C. Smelt	Lewis F. Wolfe
Theodore R. Allen	Cecil E. Rice
Glen A. Arnott	J. Evans Knowles
J. W. Hollandsworth	Francis N. Johnston

The following individuals and firms are Sustaining members (*—Institutional) for the calendar year 1959:

Alvin C. Watson	International Harvester Co.
Hoover Equip. Co.*	Harry M. Chambers
Ernest D. Walker	J. K. Vessey
Deere & Company*	Russell G. Hill
Elmer L. Sauer	H. G. Bobst
Arnold Stamp	Frank C. Edminster
Leslie Wright	Paul C. McGrew
Wm. C. Popper Co.*	A. L. Patrick
Frank H. Mendell	Pauline Skinner
Majenica Tile Co.	H. Wayne Pritchard
J. S. Russell	Howard F. Barrows
Edward H. Graham	J. E. Jordan
Donald A. Williams	Minott Silliman, Jr.
Harold E. Tower	Fred J. Sykes
David O. Davis	W. A. Rockie
Frederick Jentsch	Juan G. Maguire
I. B. Stafford	Ruth T. Douglas
C. E. Haischer	Ross Davies
Ernest E. Behn	Mrs. Gerald B. Lambert
Roy D. Hockensmith	George W. McIntosh
Carl B. Brown	L. B. Rogers, Jr.
Herbert A. Hopper	J. L. Corcoran
H. L. Pray	John T. Groover, Jr.
R. Y. Bailey	Charles F. Holz
J. M. Cutchin	Firman E. Bear
A. H. Veazey	
Thomas W. Cole	

——SCSA——

To the Editor:

I cannot recall where one issue of any publication had as many timely and interesting articles and content as the January, 1959, JOURNAL.

Particularly outstanding and useful were the articles by Don Williams; J. A. Johnson on water-use and water-rights; Humphrys' on watershed management planning; and the one on stubble mulch studies.

The entire JOURNAL is most useful for "self-improvement".

WALTER WEISS
Council Bluffs, Iowa.

It's not too late to place an order and make use of the SCSA First-Day Cover. See advertisement on page 146.

MEMBERSHIP IN SCSA, MAY 15, 1959

Society membership on May 15, 1959, was 8,641. Actually this is the low point for membership during the year. Members not paid are dropped from the rolls at that time. On the same date, there were 1,945 delinquent members. Since May 15 many payments have been received from delinquents and new members. It is anticipated that Society membership will exceed 9,000 by time of the 14th annual meeting.

States with more than 300 members include: South Dakota (431), North Carolina (397), Oklahoma (382), California (365), Iowa (362), and Mississippi (315).

Alabama	130	New York	179
Arizona	70	North Carolina	397
Arkansas	57	North Dakota	118
California	365	Ohio	169
Colorado	67	Oklahoma	382
Connecticut	42	Oregon	98
Delaware	11	Pennsylvania	196
Florida	138	Rhode Island	16
Georgia	275	South Carolina	133
Idaho	62	South Dakota	431
Illinois	262	Tennessee	240
Indiana	183	Texas	176
Iowa	362	Utah	95
Kansas	281	Vermont	33
Kentucky	190	Virginia	264
Louisiana	110	Washington	167
Maine	48	West Virginia	200
Maryland	243	Wisconsin	207
Massachusetts	39	Wyoming	63
Michigan	237	Hawaii	5
Minnesota	151	Puerto Rico	35
Mississippi	315	Alaska	2
Missouri	89	Washington, D. C.	91
Montana	48	Foreign	409
Nebraska	266	Canada	130
Nevada	20	Exchanges & Adv.	99
New Hampshire	34		
New Jersey	136	Total	8,641
New Mexico	75		

——SCSA——

ASSOCIATION OF SOUTHERN AGRICULTURAL WORKERS

The Soil Conservation Section of the Association of Southern Agricultural Workers, sponsored by the Soil Conservation Society of America, is well organized and is planning for future meetings. At the Memphis, Tennessee, meeting in February the section elected officers and selected a program committee. Alvin C. Watson, president of the SCSA has approved the selection of the program committee and its members are preparing a soil and water conservation program for the next annual meeting of the ASAW.

The following officers of the Section were elected at the ASAW Memphis meeting: Nathan I. Brown, Assistant State Conservationist, SCS, Tennessee, President; John Cockerham, SCS, Louisiana, Vice-President; and C. H. Jent, SCS, Tennessee, Secretary.

Nathan I. Brown selected the following for the program committee: Cecil W. Chapman, State Conservationist, SCS, Georgia, Chairman; T. C. Maurer and J. M. Case, SCS, Spartanburg, South Carolina; Edgar A. Hodson, Little Rock, Arkansas; H. C. Dean, SCS, Little Rock, Arkansas; Howard Matson, SCS, Fort Worth, Texas; W. A. Allaband, SCS, Richmond, Virginia; Professor Willis J. Huddleston, Nashville, Tennessee.

The Soil Conservation section had an excellent program on soil and water topics at the Memphis meeting. There were 55 attending the first session of the meeting and forty-five attending the second. Eleven papers were presented at the two sessions. These papers were good and would be a credit to any organization. Several have been submitted to the JOURNAL for publication. Edgar A. Hodson was president of the section last year and the fine program at Memphis was developed under his leadership.

The Association of Southern Agricultural Workers, of which the Soil Conservation Section is a part, meets in Birmingham, Alabama, the first week in February, 1960. This location will be very convenient for Soil Conservation Society of America members in the Southeast to attend. They will not only have an opportunity to hear a good program on conservation but will be able to meet and talk with other Society members from the Southeast.—A. H. VEAZEY, *SCSA Council Member for the Southeast, Raleigh, N. C.*

NEW CHAPTER IN KOREA

Eighteen members of the Soil Conservation Society of America working in Korea for the Office of Economic Coordination have banded together to form a chapter of SCSA. Membership will be composed of technicians in Agriculture from the United States, and, where appropriate, Korean technicians working in soil conservation.

Temporary chairman of the new chapter is Charles D. Crocker. Other members include: W. Bassett Orr, Arthur L. Mitchell, L. W. Doran, C. A. Duncan, John P. McCauley, Edwin W. Lofthouse, Paul H. France, Dexter N. Luty, R. S. Murphy, Charles A. Anderson, Granett A. Zimmerly, T. M. Ice, Ivan L. Newton, Guy E. Mabie, W. M. Nixon, Carl R. Fritzsche and Harold E. Christie.

These members may be reached through APO 301, San Francisco, California. All are now assigned to some branch of OEC.

Charter for the new chapter was sent airmail, early in June, along with the good wishes of the parent Society for a successful venture in Korea.

"THE ANNUAL MEETING," says John Loucks, steering committee chairman, "is booming along to completion. South Dakota, neighboring Canada and states are cooperating magnificently."

Below, you see Don Williams, SCS administrator and a native son of South Dakota, registering at the South Dakota Chapter exhibit in Asheville (1958 SCSA meeting).

PROGRAM

Fourteenth Annual Meeting

Rapid City, South Dakota—August 25-28, 1959

"Commemorating Soil and Water Conservation Progress"

TUESDAY, AUGUST 25

3:00 p.m.—REGISTRATION—Rapid City High School

Evening—"PINE BUCK" REDEMPTION — High School.

(Movies; Exhibits Open; Social Time)

WEDNESDAY, AUGUST 26

7:30 a.m.—REGISTRATION—Rapid City High School

9:15 a.m.—MORNING SESSION—High School Auditorium
Presiding: H. G. BOBST, Council Member SCSA, Lincoln, Nebraska

Musical Selections

Invocation—THE REV. J. DAVID LARSEN, Trinity Lutheran Church, Rapid City, South Dakota

Opening Remarks—H. G. BOBST, Chairman, Program Committee

Welcome—HUGH N. MILLER, Chairman South Dakota Chapter, Kadoka, South Dakota

Introduction of Commemorative Soil Conservation Stamp—POSTMASTER GENERAL ARTHUR E. SUMMERFIELD (or his representative)

Response—THE HON. RALPH HERSETH, Governor of Dakota

Presentation of Medallion to Hugh H. Bennett

LUNCH

1:15 p.m.—AFTERNOON SESSION—High School Auditorium
Presiding: ELMER L. SAUER, First Vice-President SCSA, Urbana, Illinois

Musical Selections

Keynote Address—ALVIN C. WATSON, President, SCSA, Upper Darby, Pennsylvania

The Fair Land About Us—H. M. BRIGGS, President, South Dakota State College, Brookings, South Dakota

Status of Missouri Basin Development—JOSEPH GRIMES, Chief, Water Resources Division, State of South Dakota, Pierre, South Dakota

SCSA Policy Committee Report—FIRMAN E. BEAR, SCSA Council Member at Large, New Brunswick, New Jersey

6:00 p.m.—WILD GAME SNACK SUPPER AND ENTERTAINMENT
Courtesy of South Dakota Chapter, SCSA

8:00 p.m.—CHAPTER DELEGATE SESSION
Presiding: I. O. HEMBRE, Chairman, Chapter Activities Committee, Madison, Wisconsin

THURSDAY, AUGUST 27

8:45 a.m.—MORNING SESSION—High School Auditorium
Presiding: WALTER C. GUMBEL, Second Vice-President, SCSA, Fairmont, West Virginia

Musical Selections

Panel: Role of Snow Surveys in Soil Conservation and Water Management—CARL B. BROWN, Moderator, Assistant to the Assistant for Watersheds, SCS, Washington, D. C.

(1) **Conduct and Technique of Snow Surveys**—MORLAN W. NELSON, Snow Survey Supervisor, SCS, Boise, Idaho

(2) **Agricultural Uses of the Data and Forecasts**—J. R. BARKLEY, Chief Engineer and General Manager, Northern Colorado Conservancy District, Loveland, California

(3) **Uses of Snow Surveys in Storage Regulation, Energy Generation and Flood Control**—HUGH A. SHAMBERGER, Director, Dept. of Cons. and Natural Resources, Carson City, Nevada

(4) **Research Needs and Progress in Snow Surveys and Snowpack Studies**—HAROLD G. WILM, Commissioner, Dept. of Conservation, Albany, New York

(5) **Research Needs and Progress in Electronic Snow Surveys**—CALVIN WARNICK, Associate Director, Engineering Experiment Station, University of Idaho, Moscow, Idaho

Research Facility Needs—CECIL H. WADELEIGH, Director, Soil and Water Cons. Div., ARS, Beltsville, Maryland

AFTERNOON SESSION—**TOURS** (Time and place to be announced in final program.) To view conservation work and other points of interest in the Black Hills, terminating at Spearfish

5:00 p.m.—BEEF BARBECUE AT SPEARFISH—Passion Play Grounds. (Purchase tickets in advance at registration desk.)

BLACK HILLS PASSION PLAY (Tickets to be purchased in advance at registration desk.)

FRIDAY, AUGUST 28

9:15 a.m.—MORNING SESSION—High School Auditorium
Presiding: HERBERT A. HOPPER, Council Member, SCSA, Lafayette, California

Musical Selections

Soil and Water Conservation—A National Problem—THE HON. FRANCIS CASE, U. S. Senator, South Dakota

The Place of State Governments in Getting Soil and Water Conservation Applied on Farm Lands—WARREN D. FAIRCHILD, Executive Secretary, Nebraska Soil and Water Conservation Committee, Lincoln, Nebraska

The Farm Equipment Industry's Interest in Soil and Water Conservation—EUGENE F. SCHNEIDER, Vice-President, International Harvester (Div. of Farm Equipment Product Planning), Chicago, Illinois

The Soil Conservation Society of America in 1959—H. WAYNE PRITCHARD, Executive Secretary, SCSA, Des Moines, Iowa

LUNCH

1:15 p.m.—AFTERNOON SESSION—High School Auditorium

Presiding: JOHN W. BARNARD, Council Member, SCSA, Washington, D. C.

Report of Chapter Activities—I. O. HEMBRE, Chairman, Chapter Activities Committee, SCSA, Madison, Wisconsin

Panel: Farm and Ranch Planning

The Farm Conservation Plan—VERN R. NELSON, Work Unit Conservationist, SCS, Shelton, Washington

Wheat Production in Wind Erosion Areas—W. EARLE JOHNSON, Dept. of Agriculture, Regina, Sask., Canada

Wildlife—WILLIAM RYDER, Michigan Department of Conservation, Lansing, Michigan

Woodlands—H. D. BURKHALTER, Director, Forestry Division, T. L. Jones and Co., Ruston, Louisiana

6:30 p.m.—EVENING SESSION—Sheraton-Johnson Hotel

AWARDS BANQUET—All awards will be presented at this time. (Purchase tickets in advance at registration desk.)

ANNUAL MEETING HIGHLIGHTS

TUESDAY evening, August 25, is scheduled for *Pine Buck* redemptions. Those individuals lucky enough to be holding these unique tokens of western roguery can cash them in at the high school. At that time, added to refreshments, there will be movies on sheep ranching and falconry. The commercial and educational exhibits will be open. In short, Tuesday evening will be both social and getting into the swing of the meeting for early registrants.

Register early and be relaxed for the start of the program on Wednesday morning.

TOURS

There will be four tours offered Thursday afternoon, August 27. On registration, Tuesday afternoon or Wednesday morning, you will be asked to designate the tour of your selection.

TOUR No. 1: Will be by bus; a general conservation tour, including range, forestry and wildlife.

Tours 2, 3 and 4 will be by private car and designed for specific objectives. All tours will end at Spearfish for the beef barbeque to be followed by the Black Hills Passion Play.

TOUR No. 2: Range and soil conservation.

TOUR No. 3: Forest management in the Black Hills National Forest—one of the best managed forests in the nation.

TOUR No. 4: Wildlife management—deer management in the Black Hills is most intensive.

(LATE FLASH: If all goes well, Morley Nelson will fly one of his peregrine falcons, made famous by a Walt Disney film, on one of the tours or at the barbecue.)

LADIES ACTIVITIES

There will be a planned program of both relaxation and guided activities for all ladies and families attending the convention. This SCSA convention is indeed a "family" affair and there will be plenty to do to assure that it goes this way.

BARBECUE EXTRAORDINAIRE!

A genuine South Dakota pit beef barbecue, extraordinary and enjoyable. Treat yourself, your family, your guests. A wonderful way to wrap up an afternoon roundup of tours through fascinating western South Dakota. Thursday evening. Schedule it and the Passion Play early upon registration. Tickets for both events will be available at the registration desk.

(LATE FLASH: Wild-food gourmets will be able to sample rattlesnake steaks at the Wild Game Feed Wednesday evening.)

WRITE FOR INFORMATION

The Rapid City, South Dakota, Chamber of Commerce, P.O. Box 747 (Att: Bart Bailey), has available literature on many points of interest in and surrounding Rapid City. Additional items can be obtained by writing the National Park Service, Washington 25, D. C.

Rock hounds, campers, nature lovers, and photographers will be in paradise.

BLACK HILLS PASSION PLAY

Josef Meier, the Christus of the Black Hills Passion Play, who portrays this part in the Play at Spearfish, South Dakota, divides his interest when at home between his work in the Production, and the development of conservation practices on his ranch three miles north of Spearfish. Meier is a cooperator in the Lawrence County Soil Conservaton program. He is an excellent steward of the land, according to Mike Craig, WUC, SCS.

Meier has learned through the years to form a partnership with the land. Through harmonious cooperation, the land has lost its forbidding feeling of isolation, and both land and man have been enriched by the affinity.

The Passion Play viewers are moved by the impressiveness of the performance. SCSA members and families will have an opportunity to purchase tickets for the Play upon registration for the SCSA convention. A special rate is offered to SCSA.

Tarik Sener and Suleyman Salali, agricultural engineers from Turkey, inspect soil and water conservation practices on the Josef Meier ranch at Spearfish, South Dakota.

PRE-CONVENTION TOURS

For SCSA members, families and guests arriving in Rapid City before the convention program convenes the morning of August 26, there is the possibility of pre-convention tours. A special desk will be open daily at the Rapid City High School on Sunday, Monday and Tuesday (Aug. 23, 24, and 25) to furnish information on tours of the Black Hills, Badlands, and other scenic, historical or conservation points of interest. Tours for private cars or commercial conveyances can be made.

For information in advance on tours and routes please write: Publicity Director, Dept. of Highways, Pierre, South Dakota, or the Black Hills and Badlands Association, Sturgis, S. Dak.

Third graders in this Pennsylvania school are absorbed in reading about the "wonder of water."

Exploring "The Wonder of Water"

JOSEPH SACCO

THE SOIL CONSERVATION SOCIETY OF AMERICA pamphlet **"The Wonder of Water"** scored heavily with third-graders at Oaklyn School, Sunbury, Pennsylvania. Their teacher, Mrs. Louise Evans, demonstrated the results in a special report to directors of the Northumberland County Soil Conservation District, who had furnished her copies of the popular, "cartoon-style" publication.

Children used the colorful item as a key reference in a thorough study of water for daily living, for plants and animals, for pleasure, for beauty—and as a potential menace when uncontrolled.

Inspired by the booklet, the youngsters developed projects in sanitation, weather, water supply systems, drainage designs and watersheds. They compiled an illustrated scrapbook including photos that showed how diversion terraces and other conservation practices put water "into harness."

Led by Mrs. Evans, they conducted many simple experiments to plumb the mysteries of water, such as comparing fresh and dehydrated fruit and vegetables, measuring the moisture in melted snow, and noting condensation on cold windowpanes.

Highlight of the third-graders' water study was creation of large multi-colored charts that showed what happens to precipitation, with and without soil conservation measures applied to the land.

To top it off, the children took a close look at soil and water progress in their own neighborhood. Mrs. Evans reported they were greatly impressed by Stone Valley Watershed, 15 miles from Sunbury, a conservation area made famous by exhibits at last year's International Boy Scout Jamboree.

Mrs. Evans is one of several Keystone State teachers to receive classroom copies of **"The Wonder of Water"** from the Northumberland SCD directors.

A scrapbook was made showing local conservation practices.

The students learned many new ways, such as bar graphs, of presenting facts about water.

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CHAPTER NEWS

Florida Chapter held its 10th annual meeting at Clearwater, with members taking a very active part in the program and only two "outside" invited speakers. Thus, talent within the chapter is being recbgnized and used. A tally of several recent and new members for the SCSA and the chapter shows Voc. Agriculture 1; Dept. of Water Resources 1; SCS 1; U. S. Corps Eng. 1; SCD supervisor 1; F.H.A. 5. Over the long run, this inclusion of a wide spread of interests in natural resources, in the rank and file of the Society and chapters leads to more vitality in programming, activities, and goals.

Georgia Chapter held another of its famous annual "family" meetings with 127 members and guests at the beautiful Rock Eagle 4-H camp near Eatonton, Georgia, on May 15-16. Square dancing, fishing, and swimming were attractions. On Saturday the program included J. D. Strange, U. S. Forest Service, who is becoming well-known for his witty and informative presentations and David Kistner, supervisor of the Ocmulgee River District.

New officers are: John Hungerford, chairman; E. R. Daniels, vice-chairman; and John Carreker, Secy.-Treas. The chapter is extending special invitations to district supervisors to join the SCSA and with the chapter.

Idaho Chapter expects to furnish some high-quality Idaho bakers (potatoes) for use at the SCSA annual meeting in Rapid City, S. D. The annual meeting of the chapter is August 13-14 at Sun Valley, where plans will be made for a more active program for SCSA members in Idaho.

Northern Illinois Chapter met on June 13 at the McKay Farms near Cordova along the Mississippi. The farms feature a large Christmas tree plantation and extensive irrigation operations. A number of Iowans slipped across the Big Father to participate in the tour and hear Claire Golden, hybrid seed corn breeder and world-traveler talk at the Saddle Club luncheon.

A color film is being produced by Prof. Strickler of Olivet College to show progress on the Kankakee State Park project, which bids in time to be one of the finest SCSA chapter projects. A pond with fish is underway. It will be flanked by demonstration plantings, including a multiflora rose hedge and a nursery of wild grasses.

M. B. Harland, who recently retired from SCS, is working on land classification for tax purposes. The chapter is interested in its members even after they retire, and wants to see trained talent kept active.

Egyptian Chapter (southern Illinois) has set up a committee to explore the formation of a student chapter at the University of Southern Illinois.

Hickman County SCD board wins against 8 districts in contest sponsored by the Kentucky Lake Chapter and designed to encourage planning, record keeping and leadership. (L-R: Winning supervisors A. Grubbs, O. Mullins, V. Ward, H. Roberts and T. Slayden.)

Hoosier Chapter (Indiana) has been centering its recent meetings around good discussions and demonstrations. A panel of four farmers, at the annual meeting in January discussed minimum tillage. Hugo Bulmahn of Adams County was one of the speakers. On May 19 the chapter visited Mr. Bulmahn's farm to see an actual demonstration of plow-plant and observe a collection of minimum tillage equipment. This meeting was held in conjunction with an area supervisor's field day. Bulmahn had colored slides of his plow-plant operations.

O. E. Ackerman, SCS management agronomist, prepared a summary of the panel and described the equipment used and rigs made by each of the farmers. There are some very definite soil and water, as well as energy conservation aspects involved in conventional and modified forms of minimum tillage. Results are increasingly being reported and improved as research and trials move forward. SCSA chapter activities, meetings, and discussions are steadily increasing in value where some of these newer methods of farming, especially soil and water aspects, are concerned.

Another recent meeting of the Hoosier chapter involved discussions of many aspects of water and water conservation. A summary was submitted to the JOURNAL by Ward Studor.

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Bemis

Iowa Chapter June newsletter had reports from two of the "areas" describing recent activities. Plans are being made for several bus loads of members to go to Rapid City in August. Maps and probably personnel for guidance are available for *any* "en route" SCSA Rapid City conventioners who may wish to see parts of the Little Sioux Watershed program. Write George Lamp, SCS, P. O. Bldg., Sioux City, Iowa, for advanced arrangements.

Members of Area II of northeastern Iowa met with the Wisconsin chapter at Pepin, Wis., on June 26. Area IV held a dinner session on May 22 at the 4-H Camp and heard Marv Anderson of Iowa State College describe (supplemented by slides) some of the findings made in India on a Ford Foundation supported project.

Announcement and rules for the 1959 Photo Contest, open to anyone in Iowa, have been printed, and are being given very wide circulation throughout the state. Ernest Behn, RFD No. 1, Boone, Iowa, is contest chairman.

Old Line Chapter (Maryland) is allotting $15.00 toward the expenses of attending the Rapid City convention to each of the first five members of the chapter applying. The chapter is also giving $100.00 to a teacher to attend the Maryland Summer Workshop on Teaching of Conservation. The annual summer meeting will be held at Ocean City July 26-27, to be followed by the Maryland Association of SCD's meeting July 27-29.

Minnesota Chapter held a dinner meeting June 26 at the Cloquet Experimental Forest, with Lawrence P. Neff, USFS, discussing several of the management phases of the Superior National Forest. The next day (Saturday) tours were made to the Wood Conversion Co. at Cloquet and the University of Minnesota Experimental Forest to see forestry and wildlife studies.

Members of the chapter will have an opportunity to partake in two special SCSA pre-convention tours en route to Rapid City. Stops and tours will be made at Oahe Dam and the Badlands.

The June newsletter carried a short technical note on "Fertilizers and Soil Conservation" by C. J. Overdahl. [*Editor's Note:* Use of chapter newsletters in several states to carry brief technical notes and research and projects progress has been noticeable in the past year. By such newsletter reporting chapter members are being kept informed of *what, how, where, who, when* and *why.*]

The Minnesota chapter has prepared a very attractive brochure directed at obtaining new members for the chapter and SCSA.

Mississippi Chapter plans to exceed the 400 mark in total membership before August. Two areas will engage in a "conservation" sticker to be placed on every loaf of bread sold. An award plaque has been made available to the boy showing most improvement in soil and water conservation activities during the annual Boys Conservation School at Morton.

Show-Me Chapter (Missouri) included in its June newsletter a short section describing the status of certain new experimental plantings made on the Plant Materials Center at Elsberry.

The chapter expects to obtain more publicity about its goals and programs in state publications and newspapers, sell more SCSA booklets, and make "members of the chapter" (with due credit to the chapter) available to various youth and adult organizations for talks, aiding with exhibits, etc.

The entire April newsletter was devoted to getting acquainted with many of the members. Editor Roger Sherman did some excellent thumb-nail sketches—a very "human" way of building coherence and strength in a chapter.

The Lincoln Chapter (Nebraska) met April 9 at the University in Lincoln with 30 members present and 10 members of the student chapter and Agronomy Club of the University. The SCSA Public Policy committee report was discussed and ratified. Prof. L. W. Hurlburt, chairman of the University of Nebraska Department of Agricultural Engineering gave an illustrated talk on "Farm Mechanization in Russia." Norris Swanson is serving as chairman of Programs.

South Central Oklahoma Chapter held its annual spring meeting May 23 at Sulphur (Platt National Park Museum). A guided tour was made of the Turner Ranch and Farm and Platt National Park area. Lively discussions were had on rangeland, pastures, livestock, irrigation, and national parks. Fishing, barbecue, slide lecture on parks, and square dancing rounded out an unusually fine program, which was well attended by members, families and guests.

South Dakota Chapter of the Soil Conservation Society of America is one of the organization's most active. Its membership is nearing 500. The list includes the names of Governor Ralph Herseth, Senators Francis Case and Karl Mundt and Representatives E. Y. Berry and George McGovern. A newsletter goes out four times a year to members. Hugh Hiller, a Soil Conservation Service work unit conservationist at Kadoka, is 1959 chairman, and he reports "the members are all working hard to make the 1959 SCSA Convention a most memorable meeting."

In 1958 the chapter took the leadership in distributing 50,000 copes of "Wonder of Water" among school children. It offers a senior conservation award annually to an adult and two junior awards, to 4-H and FFA nominees.

A $50 chapter scholarship in conservation goes annually to a student in State College at Brookings. The chapter's educational committee helps set up workshops in conservation for school teachers.

A late dispatch from John Loucks, chairman of the steering committee for the SCSA convention showed clearly the very tremendous sense of cooperation among members that has developed in the chapter. It is safe to say that most all, if not all, members are working on some task concerned with the Rapid City SCSA meeting. Their goal? To make the 1959 convention the best yet and a wonderful, pleasant and informative affair for SCSA members, families and guests.

West Virginia Chapter was one of active cooperating organizations in the Salem Fork Watershed Project in West Virginia. This watershed was a co-recipient of the "Watershed Project of the Year" award of the National Watershed Congress meeting in Washington, D. C., on May 25. The West Virginia Chapter received national publicity because of this cooperation.

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You won't want to miss this important film, so plan now to arrange for a FREE showing. Please request reservations at least four weeks in advance of showing date. Write Dept. SWC-91, 300 W. Adams St., Chicago 6, Ill.

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UNITED STATES GYPSUM

*T. M. Reg. U.S. Pat. Off.

Virginia Chapter has a "hot" SCSA booklet sales contest going, with the winner (individual) to receive a $75.00 cash award. On total sales nationally Virginia is second, with South Dakota first. On May 18, the sales in Virginia had reached almost 40,000 with two members, W. H. Mann and Paul Batchelor tied for first with 6,000 each.

The newsletter under the lively editorship of Ruth Douglas continues to carry much news of members, parent society, annual convention, and anouncements of in-state meetings. An active "Articles for Publication Committee" is concerned with getting Virginia articles published in the JOURNAL and elsewhere. Chairman of this committee is Bob Giles who has become known nationally for his fine study of *"Virginia School Pupils' Knowledge of Soil and Water Conservation."* Single free copies of this study can be obtained by writing Extension Service, VPI, Blacksburg, Va.

NEW SCS DEVELOPMENT . . .

WASHED OUT!

STABILIZED!

THE DIFFERENCE!

Rains continually washed out this critical waterway on a Maryland farm. Graded and seeded again, this same waterway was soon subjected to heavy downpour. But, this time, the waterway held! THE DIFFERENCE — an idea conceived and developed by Soil Conservation Service technicians: *the use of jute thatching to stabilize critical waterways while grass takes over.*

Write for facts about this new method of stabilizing waterways.

See Journal of Soil and Water Conservation, May '59, pgs. 117-119. "Jute for Waterways"; R. V. D. Broach, C. S. Slater, M. T. Augustine, and E. E. Evaul.

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The Wisconsin Chapter has made a concerted drive to include in its membership representatives of all phases of conservation. Its over-all goal is *to assemble facts, interpret the meaning of available information, aid in formulating sound policies, and spread the development of constructive attitudes and appreciation on the problems of managing soil, water, forestry and wildlife.* Since 1954 it has doubled in membership. To become further effective as one of the outstanding forces in the "science and art of good land use" in Wisconsin, the chapter has prepared an excellent brochure describing *what's in this for you; objectives; how do we operate; who are our members; who can be members; and what are we doing?* A flyer insert lists current officers and the tentative program for the remainder of 1959.

Wisconsin Chapter prepared an ingenious guideline (processed) entitled, "Special Objectives for 1959." The 1959 goals were stated, then followed by a three column set up wherein the headings were: *Objective; Who;* and *How.* SCSA Executive Secretary Pritchard sent a copy of this item to all chapters of the Society. Ask your chapter secretary about it.

Northern New England Chapter (Maine, Vermont, New Hampshire) held its annual meeting May 15-16 in Portland, Maine, with over 100 members present. LeRoy Bingham, assisted by five other members, planned the program. A tour of the Burnham and Morrill Packing Co. and luncheon courtesy of B. & M. were featured the first day. Project activities of the three states were demonstrated and described in the afternoon, followed by an evening banquet. Speakers on the evening program included George Morrill, A. C. Watson, president SCSA, and Stephen Powell, Maine Department of Fisheries and Game. Awards were made for outstanding demonstrations and Club 5. Professional papers (8) were given Saturday morning and touched on land use changes, research, organic soils, role of rock in slowing up erosion, drainage, a 43-year history of gully development on a New Hampshire farm, soil maps of forested lands, and Christmas trees.

A special program for families and ladies was held with tours, a tea, shopping, and "nightclubbing" featured.

Southern New England Chapter (Conn., Mass., and Rhode Island), according to its May newsletter, planned for a "Bird's-Eye View of Conservation" sometime in late May or early June. Teachers, scientists, and other members of the chapter will take off in a large transport plane and fly a low-level two-hour planned tour of the three states. En route, experts in several fields of conservation will point out and describe features of interest on assigned areas. Maps will be prepared ahead on the proposed routes. If the weather is clear there should be a lot of camera clicking on this trip. Charlie Hammarlund, Jr., along with a special committee, made reconnaissance flights to get the final tri-state route lined up.

NEWS OF MEMBERS

Jack Densmore, Wisconsin State Soil Conservationist, reports that a basic plan for the Platteville State College Farm has been developed. More and more educational institutions are bringing their land holdings (farms and forests) under best-known conservation management. This not only increases production but sets up valuable educational laboratories, provided faculty and students are kept informed and engage in cooperative activities.

Louis M. Glymph, Jr. is now Acting Chief of the Watershed Technology Research Branch of ARS, Beltsville, Md. He has long been active in flood control and sedimentation work, particularly engineering phases.

David E. McCorkle, SCS conservation aid of Rockingham, Virginia, work unit, has been appointed chairman of the conservation committee for Ruritan National.

G. E. Ryerson has been assigned to head up the reorganized SCS small watershed program division dealing with contracts and contractors. The division's deputy is **Ralph Wright.**

Glendon C. Burton, SCSA member in West Virginia, was author of a story and photo-spread in the March, 1959, *Farm Journal,* entitled, "Contract for your conservation." Burton described the "package deals" worked out by districts in building ponds, planting trees and tiling wet spots.

Harry H. Bailey, Agronomy Dept., University of Kentucky, Lexington, Ky., left June 1 with his family on a two-year ICA assignment with the Kentucky Contract Team, University of Indonesia, Bogar, Java, Indonesia. He is scheduled to teach courses in soils, organic soils, and irrigation. En route out he will visit Hawaii, Japan, Philippines, Hong Kong and Singapore. On return he will visit Egypt, Greece, and other European countries.

E. M. Jackson of Melbourne, Australia, is, under the cooperation of the Wangaratta Film Society, completing a soil and water film. The film group is also preparing 35 mm. film strips for school use.

Wallace L. Anderson, Washington-Field biologist (SCS) with headquarters in St. Paul, Minn.; **Einar L. Roget,** SCS watershed specialist, Riverside Calif.; **Floyd W. Campbell,** SCS assistant state conservationist, Burlington, Vt.; and **Albin T. Chalk,** SCS area conservationist, Mt. Pleasant, Texas, have been selected to attend the 1959-60 Land Use and Conservation Seminar at Harvard University. [The Harvard program was described in the November, 1958, JOURNAL.]

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The all-new BANTAM C-350 crawler combines fastest digging ability with true job-to-job mobility. Its high production assures more channels cleared, more miles of ditch dug, more ponds and more reservoirs built per season! Its compact, practical size gives you faster moves between jobs with travel over highways permit-free.

When you swing into a job with a BANTAM C-350, you immediately discover its surprising work speed and easy operation. The C-350 gives you fast-cycle operation because of its advanced, balanced design; the use of anti-friction bearings throughout, and its rugged power. And the C-350 is easier to operate because of its foolproof mechanical controls that defy heat, cold and moisture.

You can work anywhere with a C-350 BANTAM crawler. Its ground bearing pressure is low—2½ lbs. p.s.i. when using 32″ pads and long side frames. Result: you can work rapidly in wet, mucky ground without matting. BANTAM goes where no other machine with its capacity can work so effectively.

The BANTAM C-350 is versatile—offering the widest choice of job-matching equipment. It works and earns with 11 BANTAM-built attachments—plus new special-design "V" bucket that gives up to 400′ of 3½′ ditch per hour! Try the all-new BANTAM C-350 before you buy. Call your BANTAM distributor today for a free on-your-job demonstration.

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Latest population count: 173,888,000. In a scant 6 years, we'll have 20 million more people to feed and clothe — an increase far greater than the *entire* population of Canada! Beyond that, economists put our population at 225 million by 1975. To meet the challenge, your farm will be pushed to undreamed of productivity. Land improvements will play an important part in maintaining our standard of living.

Here's how one young farmer is gearing up to meet the future

He's Norris Raun, 37-year-old rice grower and cattleman of El Campo, Texas. Starting from scratch, he has carved a 5000 acre ranch out of scrub timberland. With bulldozer and determination, he cleared land, filled low spots, cut down ridges. He drilled wells, dug irrigation canals, built levees. Land that once grew only rattlesnakes makes 30 bushels of rice per acre, or carries a cow for every couple of acres. And, the ranch is still expanding.

Here's the point: this all took time. In fact, Raun has been working on land improvement for ten years, and he has more plans for the future. What he's done would take *generations* with ordinary wheel farm tractors or muscle power. That's why Raun chose Cat-built equipment. And after the ground was prepared, he found his Cat Diesel Tractor the best farm power yet — with the lowest operating costs — greatest work capacity — versatility and longest life of *all* farm tractors, whether on wheels or tracks.

If you've been thinking of improving or expanding your farm, now is the time to start it! See your Caterpillar Dealer for complete information on the equipment you'll need.
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Cat Diesel Tractors pull a 400' loop of anchor chain to cut a 75' swath through scrub growth. Another Cat track-type Tractor pushed out the big trees.

Tough spots were cut and filled to grade by bulldozer, or Cat Diesel Tractor and Scraper. This assures even water coverage, helps prevent drowning or burning crops.

For routine farm work, Norris Raun proves you can't beat a Cat Diesel Tractor. Here, a Cat D6 Tractor (75DBHP) pulls his home-built levee builder.

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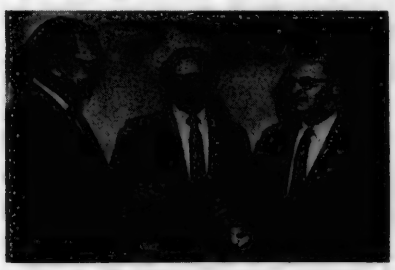
NEWS OF MEMBERS

At the recent National Watershed Congress held in Washington, D. C. the following SCSA members were on the stated program: **Clifford R. Hope, Herbert B. Eagon, Eleanor E. Hanlon, William Voigt, Jr., Walter C. Gumbel, Don A. Williams,** and **Edward M. Davis.**

The USDA, in appropriate ceremony held May 26, conducted its annual awards program. A number of SCSA members were recognized.

Arnold C. Orvedal, SCS, Beltsville, Maryland, received one of the seven Distinguished Service Awards. He was honored "for the development, from generalized and estimated soil maps, of unique worldwide terrain intelligence maps and interpretive information of highest importance to the defense of the United States."

Among the 174 USDA employees receiving the Superior Service Award were the following SCSA members: **Carl Brown** (Washington, D. C.); **Julian E. Brown** (Monroe, Georgia); **Thomas S. Buie** (Columbia, S. C.); **Cecil E. Clapp** (Atlanta, Ga.); **Verne E. Davison** (Athens, Ga.); **Clarence A. Dyson** (Lemmon, S. D.); **Edwin Freyburger** (Milwaukee, Wis.); **Ellis L. Hatt** (Portland, Ore.); **Roy D. Hockensmith** (Washington, D. C.); **Charles P. McKinnie** (Erie, Kan.); **Verna C. Mohagen** (Washington, D. C.); **Joseph R. Sasser** (Nashville, Tenn.); **D. Harper Simms** (Washington, D. C.); and **Walter Weiss** (Council Bluffs, Iowa).



Cecil H. Wadleigh (left) presents a USDA group superior service award to the ARS erosion control research unit at Purdue University. **Walter H. Wischmeier** (center), project administrator, and **D. D. Smith,** Beltsville, project supervisor, received unit citation "for making notable improvements in the slope-practice method used in selecting conservation practices for individual fields, and for developing the framework of a universal slope-practice equation."

Among the SCSA members that participated in the annual meeting of the American Association for Conservation Information held in Pennsylvania, May 24-27, were: **Joseph J. Shomon,** chief of the education division of the Virginia Commission of Game and Inland Fisheries; **Milton E. Bliss,** producer, National Farm and Home Hour (NBC); **Richard L. Weaver,** University of Michigan; **David W. Walker,** student member, SCSA, University of Michigan; **Lloyd Partain,** Curtis Publishing Company; and **George L. Fersh,** Joint Council on Economic Education.

Clayton Hoff, of the Brandywine watershed, talked recently in New York before the Conewango and the Limestone watershed groups.

Alden J. Erskine of Sioux City, Iowa, was reelected national treasurer of the Izaak Walton League of America for 1959-60. At the IWLA 37th annual meeting held in Philadelphia in April, **Walt Gumbel** spoke on sportsmens' relationships with land owners. The League is actively promoting a fine program of improved sportsmanship.

Some recent materials received from **Herbert A. Hopper,** Western Region Council member, points out the tremendous increase in amount of soil and water conservation news that has been brought about by various channels of the SCSA. In total, the annual flow of worthwhile information emanating from the SCSA office, officers and representatives of the Society and chapters must be considered impressive. Nevertheless, the surface has only been scratched.

Edgar A. Hodson, SCSA member, Little Rock, Arkansas, has been very helpful in getting to the JOURNAL editorial office copies of all papers given during the recent meeting of the Association of Southern Agricultural Workers.

Verne R. Hillman is now in the States on "home leave" from his assignment in Indonesia where he has served since 1954 with the International Cooperation Administration in soil and water conservation programs. The Hillmans reside in Blacksburg, Va.

William W. Russell, formerly of St. Paul, Minn., and active in the Minnesota Chapter, became the new assistant state conservationist for Wisconsin, replacing **Ray Brown. David P. Mueller** succeeds **Charles H. Buell** as state SCS administrative officer in Wisconsin.

The following Wisconsin SCSA members were honored by the Wisconsin Chapter at its annual meeting in January: **Lew French** (Milwaukee Journal), **Marvin Schweers** (SCS), **M. N. Taylor** (Trees for Tomorrow), and **Pearl Pohl** (retired school teacher). Harold Kruse, farmer from Sauk County was also honored.

Early in May, **Charles E. Kellogg,** SCS, Washington, D. C., returned from an assignment in India with a Ford Foundation team on agricultural production. The team's report (259 pages) has already been published by Government of India. En route home, Viet-Nam and Hawaii were visited to examine work in progress on soils and conservation. **J. H. Christ,** SCS Conservationist of Hawaii, was host during the Hawaiian visit.

Other SCSA members of the team to India were **Marvin Anderson** of Ames, Iowa, and **O. J. Kelley** of Fort Collins, Colo. Anderson recently reported many of his observations in an illustrated talk before the central area of the Iowa SCSA chapter.

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Only your Caterpillar Dealer offers you these three protected buys on used equipment. Which is best? That depends on how you want to use a unit and what you want to pay. Whatever you want, you'll find it in his lot.

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NECROLOGY

Ross D. Davies died unexpectedly June 24 in Huron, South Dakota, of complications following surgery. He was SCS State Conservationist of South Dakota. He has long been a keen supporter of the SCSA and is well-known to its members throughout North America. Up to the time of his death he had been actively at work on the SCSA 14th Annual Meeting steering committee.

Ross D. Davies

Howard Ballew, work unit conservationist in Wayne District, Iowa, died May 21. He started work with the SCS as an agronomist at the CCC camp near Marion, Iowa, in the 1930's.

D. S. Bishop, an SCS retiree, formerly of Greenfield, Indiana, and more recently residing in Fort Lauderdale, Florida, died April 29.

Roy Ihlenfeldt, conservation supervisor in the State Department of Public Instruction, Madison, Wisconsin, died February 13. He was active in the Wisconsin chapter. He is survived by his wife and two sons.

D. L. Johnson, work unit conservationist, SCS, Prentis, Mississippi, died during April this year, following a heart attack. He was a long-time member of the SCSA and active in the Mississippi Chapter.

Karol J. Kucinski, project supervisor USDA at Amherst, Massachusetts, died March 16 after a long illness. Dr. Kucinski was deeply interested in improving the productivity of soils.

Harold R. Love, State Administrative Officer for Soil Conservation Service in Arizona, passed away last fall. He has been a member of the Society for eight years.

Frank D. Martin of Owatonna, Minnesota, died April 18. He has been with the Soil Conservation Service since 1935 and was, at the time of his death, an SCS area conservationist.

Austin W. Zingg, chief, Watershed Technology Research Branch, ARS, Beltsville, Md., died in Fort Collins, Colorado, on April 7, 1959. He began his career in soil and water research in 1934 at Bethany, Mo. He became known internationally as an authority on the mechanics and control of both wind and water erosion. He is survived by his wife, a son and a daughter.

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2. Modern conservation farming and what it means in a fast-changing agriculture.

3. What the Small Watershed Program and other public programs provide in new opportunity for farmers and contractors.

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